UC-NRLF
B 2 933 795

Permanent International Association

OF

NAVIGATION CONGRESSES

PROGRAMMES OF THE PROCEEDINGS
NAMES OF THE REPORTERS
SUGGESTIONS AND CONCLUSIONS

OF

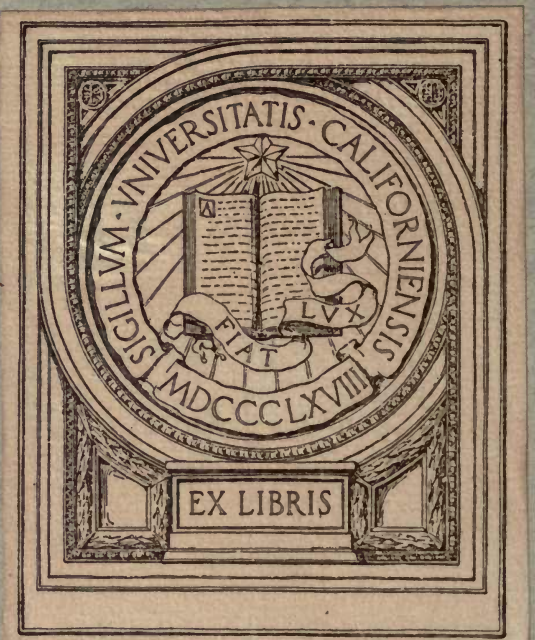
XII INTERNATIONAL NAVIGATION CONGRESSES

1885-1912

EXECUTIVE COMMITTEE-OFFICE OF THE SECRETARY GENERAL

38, RUE DE LOUVAIN

BRUSSELS



ENGIN.
LIBRARY

Permanent International Association

OF

NAVIGATION CONGRESSES

PROGRAMMES OF THE PROCEEDINGS
NAMES OF THE REPORTERS
SUGGESTIONS AND CONCLUSIONS

OF

XII INTERNATIONAL NAVIGATION CONGRESSES

1885-1912

EXECUTIVE COMMITTEE — OFFICE OF THE SECRETARY GENERAL

38, RUE DE LOUVAIN, 38

BRUSSELS

TC5
I5
1912
ENGIN.
LIBRARY

PERMANENT INTERNATIONAL NAVIGATION CONGRESSES

1885-1912

EXECUTIVE COMMITTEE — OFFICE OF THE SECRETARY GENERAL
38, RUE DE LOUVAIN, 38
BRUSSELS

INTRODUCTION

The International Navigation Congresses have brought together, in the form of a most valuable collection of reports, the results of the most recent studies by the leading Engineers and Specialists throughout the world.

The works entailed, the technical handling of traffic on waterways and in harbours, as well as the technical and economic questions which arise therefrom and which are the subject of the reports, are discussed at the meetings of the Congress, not only by the reporters themselves, but by the leading experts in such matters coming from those countries where extensive hydraulic undertakings have been, or are being, carried out.

The suggestions and decisions arrived at give the concensus of opinion of the leading experts at the time of discussion, on each of the several questions under review; they form an excellent record of the conclusions arrived at, and are of the greatest value to Public Authorities, Chambers of Commerce, Scientific societies and all who are interested in the advancement of inland or sea-going navigation.

Up to now the suggestions and conclusions of our Congresses lay scattered among a number of reports of the proceedings of various sessions, most of which were out of print. We have collected them together in the following work, prefacing them by the programme of proceedings of each Congress, the names of the writers, and the titles of the reports sent in by these latter.

To facilitate research, and in order to show clearly the practical results of our meetings and the utility of the Navigation Congresses, we have given, after the above mentioned information, three tabulated lists; the two first are alphabetical, and give the names of the writers and those of the waterways and harbours mentioned in this work; the third is according to the subject matter: it shows, both as regards inland and sea-going

285342

navigation (which constitute the two main sections of the Congresses), the subjects which have been discussed up to the present day; references allow of easily finding the origin of any question mentioned in this latter table and the titles of the reports, as well as the wording of the suggestions and conclusions arrived at.

J. RICHALD.

HIGH PATRONS OF THE NAVIGATION CONGRESSES

1st. Congress Brussels 1885	The Belgian Government.
2nd. Congress Vienna 1886	His Imperial and Royal Highness the Archduke Rodolphe, Crown Prince of Austria-Hungary.
3rd. Congress Frankfort-on-Main 1888	His Imperial Majesty William II, Emperor of Germany, King of Prussia.
4th. Congress Manchester 1890	His Royal Highness Albert Edward, Prince of Wales.
5th. Congress Paris 1892	Monsieur Sadi-Carnot, President of the French Republic.
6th. Congress The Hague 1894	Her Majesty the Dowager Queen Emma, Queen Regent of the Netherlands.
7th. Congress Brussels 1898	His Majesty Leopold II, King of the Belgians.
8th. Congress Paris 1900	Monsieur Loubet, President of the French Republic.
9th. Congress Dusseldorf 1902	His Imperial and Royal Highness Frederick William, Crown Prince of the German Empire.
10th. Congress Milan 1905	His Majesty Victor Emmanuel III, King of Italy.
11th. Congress St-Petersbourg 1908	His Imperial Majesty Nicholas II, Emperor of Russia.
12th. Congress Philadelphia 1912	His Excellency William Taft, President of the United States of America.

HIGH PATRONS OF THE NAVIGATION CONGRESSES

1st. Congress Brussels 1885	The Belgian Government.
2nd. Congress Vienna 1886	His Imperial and Royal Highness the Archduke Rodolphe, Crown Prince of Austria-Hungary.
3rd. Congress Frankfort-on-Main 1888	His Imperial Majesty William II, Emperor of Germany, King of Prussia.
4th. Congress Manchester 1890	His Royal Highness Albert Edward, Prince of Wales.
5th. Congress Paris 1892	Monsieur Sadi-Carnot, President of the French Republic.
6th. Congress The Hague 1894	Her Majesty the Dowager Queen Emma, Queen Regent of the Netherlands.
7th. Congress Brussels 1898	His Majesty Leopold II, King of the Belgians.
8th. Congress Paris 1900	Monsieur Loubet, President of the French Republic.
9th. Congress Dusseldorf 1902	His Imperial and Royal Highness Frederick William, Crown Prince of the German Empire.
10th. Congress Milan 1905	His Majesty Victor Emmanuel III, King of Italy.
11th. Congress St-Petersbourg 1908	His Imperial Majesty Nicholas II, Emperor of Russia.
12th. Congress Philadelphia 1912	His Excellency William Taft, President of the United States of America.

INDEX

INTERNATIONAL CONGRESSES OF INLAND NAVIGATION

1st Congress. Brussels. 1885.

	Pages
Programme of the proceedings of the 1st Congress	1
Names of the reporters and titles of the reports	4
Various publications	5
Conclusions adopted by the 1st Congress	6

IInd Congress. Vienna. 1886.

Complete programme of the proceedings of the 2nd Congress	13
Names of the reporters and titles of the reports	15
Communications	16
Various publications	16
Conclusions adopted by the 2nd Congress	18

IIIrd Congress. Frankfort on Main. 1888.

Complete programme of the proceedings of the 3rd Congress	23
Names of the reporters and titles of the reports	25
Various publications	27
Conclusions adopted by the 3rd Congress	28

IVth Congress. Manchester. 1890.

Complete programme of the proceedings of the 4th Congress	33
Names of the reporters and titles of the reports	35
Various publications	38
Conclusions adopted by the 4th Congress	39

Vth Congress. Paris. 1892.

Complete programme of the proceedings of the 5th Congress	47
Names of the reporters and titles of the reports	51
Communications	56
Various publications	56
Conclusions adopted by the 5th Congress	58

VIth Congress. The Hague. 1894.

	Pages
Complete programme of the proceedings of the 6th Congress . .	69
Names of the reporters and titles of the reports	72
Communications	75
Various publications	76
Conclusions adopted by the 6th Congress	77
Fusion of the Congress of Inland Navigation and the Maritime Congress. The Congresses will be designated in future " Navigation Congresses "	86

INTERNATIONAL NAVIGATION CONGRESSES

VIIth Congress. Brussels 1898.

Complete programme of the proceedings of the 7th Congress . .	87
Names of the reporters and titles of the reports	91
Communications	97
Various publications	99
Conclusions adopted by the 7th Congress	100
Commission of Studies for the elaboration of a scheme of permanent organisation for the International Navigation Congresses	115

VIIIth Congress. Paris. 1900.

Complete programme of the proceedings of the 8th Congress . .	121
Names of the reporters and titles of the reports	123
Communications	127
Various publications	129
Conclusions adopted by the 8th Congress	130
Constitution of a Permanent Commission of the Navigation Congresses	135
Role of the Permanent International Commission	139
Meeting of the Permanent Council of the Permanent International Commission at Brussels, 24th June. 1901	141

IXth Congress. Dusseldorf. 1902.

Complete programme of the proceedings of the 9th Congress . .	147
Names of the reporters and titles of the reports. Names of the general reporters	152
Various publications	162
Conclusions adopted by the 9th Congress	170
Constitution of the Permanent International Association of Navigation Congresses. Meeting of the Permanent International Commission at Dusseldorf, 2nd July. 1902	175

Xth Congress. Milan. 1905.

	Pages
Complete programme of the proceedings of the 10th Congress .	181
Names of the reporters and titles of the reports. Names of the general reporters	184
Various publications	195
Conclusions adopted by the 10th Congress	199

XIth Congress. St-Petersburg. 1908.

Complete programme of the proceedings of the 11th Congress .	205
Names of the reporters and titles of the reports. Names of the general reporters	208
Various publications	217
Conclusions adopted by the 11th Congress	221

XIIth Congress. Philadelphia. 1912.

Complete programme of the proceedings of the 12th Congress .	233
Names of the reporters and titles of the reports. Names of the general reporters	235
Various publications	246
Conclusions adopted by the 12th Congress	251
General Recapitulation of the programmes of the proceedings of the 12 International Navigation Congresses	257

INTERNATIONAL MARITIME CONGRESSES

Ist Congress. Paris. 1889.

Names of the reporters and titles of the reports	281

IInd Congress. London. 1893.

Names of the reporters and titles of the reports	284
Fusion of the Maritime Congress and the Congress of Inland Navigation. (See 6th Congress afore-mentioned.)	287

INTERNATIONAL CONGRESS FOR THE UTILIZATION OF RIVERS

Ist Congress. Paris. 1889.

Names of the reporters and titles of the reports	288

ALPHABETICAL INDEX

AND

SUBJECT MATTER INDEX

Pages

1. *Names of the authors in* **alphabetical order.** 291

2. **Alphabetical table** *of the waterways and ports mentioned in this work, by name or by country.* 303

1) INLAND NAVIGATION

a) Rivers with free-running current (1) 303
b) Inland canals 303
c) Waterway system of various countries 304
d) Inland ports 304

2) OCEAN NAVIGATION

a) Tidal and non-tidal main-streams 305
b) Ship canals 305
c) Sea ports 306

3. **Subject matter** *index of the proceedings of the Navigation Congresses.* 309

1° INLAND NAVIGATION

A. — *Working and management.*

a) Rivers with free-running current.
Improvements; Formulary; Dredging; Reservoirs; Conditions of flow and discharge of rivers; Shallow waterways . . 309
b) Canalised rivers.
Improvements; Dams; Defence of banks; Locks; Management. 310

(1) Rivers with « *free-running current* » are also termed « *Single current* » rivers; the term « *double current* » rivers is only applied to the tidal portions of rivers which only flow into the sea at low water.

Pages

c) Canals.

Construction, improvements, cross-sections. Defence of banks. Management. Water-supply and prevention of leakage. Reservoir-dams. Locks; lock gates. Locks with a great fall of water. Lifts and inclined planes. Moveable bridges . . 311

d) Inland ports.

Construction; Maintenance; Working (equipment, system of linking up the railway and the ports) 312

e) Matters relating to navigation.

Tractional resistance of vessels. Shape of vessels and of the cross-sectional area of waterways. Traction and propulsion. Delays. Barges. Tests made by means of small scale models 313

f) Hydrography. Flood warnings. Reinforced concrete. Various.

Hydrography. Hydrometry. Flood warnings. Reinforced concrete. Effects produced by the construction of canals on subterranean streams. Influence of the destruction of forests and the draining of marshes on the conditions of flow and discharge of rivers. Preservation of low lying districts from the effects of floods 313

B. — *Commercial, economic and social questions.*

Statistics of navigation. Unification of the system guaging tonnage on inland waters. Economics of waterways. Waterways and railways. Taxes and tolls. Duties of the State. Traction monopolies. The mortgaging of waterways. Staff of the barge trade 314

2° OCEAN MARITIME

A. — *Working and management.*

a) Tidal rivers.

Improvements obtainable in tidal rivers, in their lower reaches, including the estuaries. Formulary of characteristic information, as regards a tidal river. Measurement of the volume of tidal water. Experiments by means of models. . . 315

b) Tideless rivers.

Improvements obtainable in tideless rivers in their lower reaches including the estuaries 316

Pages

c) Ship canals.

Junction canals. Canals penetrating inland. Cross-sections. Defence of the banks. Locks. Lock-gates. Moveable bridges. Management 316

d) Sea ports.

Lighting and buoying of the coast. Marine signals. Coast ports, maritime harbours, free ports, fishing ports, harbours of refuge for coasting vessels. Channels and outer-harbours. Piers, jetties, breakwaters. Wharf and dock walls. Locks. Lock-gates. Moveable bridges, transporters, tunnels. Repairing plant. Dredging (dredgers, rock breakers, submarine drills). Relative area of various parts of a harbour. Wharehouses and sheds. Equipment 317

e) Matters relating to navigation.

Tractional resistance of vessels in the open sea. Methods of propulsion. Sea-going barges, ferry boats, nautical stores. Liquid fuels. Safety of navigation 318

f) Hydrography. Reinforced concrete. Materials.

Ocean hydrography. Reinforced concrete (its use for marine works). Cement, sand 319

B. — *Commercial and economic questions.*

Utility of ship canals. Taxes, tolls, wharf dues, method of collection. Commercial working and management of waterways and sea-ports. Measures taken by various governments to protect navigation. Responsibility of ship-owners as regards the public and public authorities. Maritime personel 319

ADDENDA

A. Regulations of the Permanent International Association of Navigation Congresses. 1913 Edition 323
B. Permanent International Commission of the Navigation Congresses 336
C. Permanent Council of the International Commission 347
D. States subscribing to the Permanent International Association of Navigation Congresses 353

INTERNATIONAL CONGRESS

OF

INLAND NAVIGATION

I^st^ Congress

Brussels 1885

PROGRAMME OF THE PROCEEDINGS OF THE CONGRESS

QUESTIONS.

FIRST QUESTION. — **What are the conditions necessary for a ship canal to be of value, in other words, for the advantages obtainable to be sufficient to compensate the expense entailed in the construction and maintenance of the canal?**

(The term canal is used in a general sense and is applicable to rivers whose course has been so improved as to allow of navigation.)

SECOND QUESTION. — **Is it desirable that all inland canals should belong to the State?**

THIRD QUESTION. — **Is it adviseable to apply to all inland canals the principle of freedom from tolls, such as exists on the Lake Erie canal and the canals belonging to the French Government?**

FOURTH QUESTION. — **Does the cost of construction of a canal in a given subsoil increase in proportion to the area of its cross section? What types of canal should be adopted?**

FIFTH QUESTION. — **Which are the best machines in use for canal construction?**

SIXTH QUESTION. — **Which are the best methods of construction for the retaining walls of wharves and docks?**

SEVENTH QUESTION. — **What are the best means for consolidating the banks so as to allow operating at high speed.**

EIGHTH QUESTION. — **Which are the different systems of working canals, more especially from the point of view of traction?**

NINTH QUESTION. — a) **What are the advantages of the different systems of locks?** — b) **What is the greatest allowable lift?** — c) **What are the advantages of locks set side by side?**

Note on the programme of studies.

The programme drawn up by the organising Committee of the first Congress included the consideration of eighteen technical and economic questions. The economic portion was sub-divided into three sections, containing altogether eleven questions which had to deal respectively with *canals in general*, *ship-canals* and *fresh water canals*. The technical portion consisted of one section which had to deal with seven questions. The questions which gave rise to discussion were nine in number; they therefore formed the programme of studies considered by the Congress and mentioned above. Six Committees were charged with the duty of reporting on the opinions put forward during the course of the sittings, and of proposing resolutions which were submitted to the approval of the final meeting of the whole Congress.

The technical and economic questions which could not be discussed were as follows :

I. Which is the best method of linking up the main sea ports with the interior of a country?

Should preference be given to railways or canals? The question should be considered both from the point of view of an existing canal or waterway, and from that of a canal requiring to be built. What are the conditions under which we should give preference to a canal, and what are the circumstances which will influence the importance to be given to it?

2. Should an inland canal solely link up the interior of the country with a neighbouring sea port, or should its radius of action include a number of other ports? How far should its radius of action extend?

Show reasons for and against.

3. What are the results obtainable at present in the working of ship-canals?

Explain the results obtained by means of graphs.

4. What are the results expected from the various ship-canals now under construction?

5. Is it desirable that ship-canals should be the property of the State?

Should we apply to ship-canals the principle of freedom from tolls?

6. Can we admit, generally speaking, the principle of equal freight rates for a series of neigbbouring harbours situated along the coast or inland?

What conditions are requisite for the application of a uniform freight rate? Give instances.

7. What are the necessary conditions for an inland canal to be of utility, in other words, for the expense of construction and maintenance of the canal to be more than counterbalanced by the advantages obtainable? (The word canal is here used in a general sense and applies also to rivers which have been rendered navigable).

8. What are the results obtained up to the present from canals? Show the results by means of graphs.

9. What are the results expected from the various inland canals now under construction?

10. Which are the best machines for use for the working plant of docks?

NAMES OF THE REPORTERS

AND

TITLES OF THE REPORTS SUBMITTED TO THE 1st CONGRESS

1. **Van Drunen,** J. — The role of canals in the future. (Belgium) (F.)
2. **Van Drunen,** J. — Note on hydraulic lifts and inclined planes. (Belgium) (F.)
3. **Teugels Op De Beeck.** — A short note on the management of canals and on the intervention of the State in this matter. (Belgium) (F.)
4. Merorandum in answer to questions submitted by the Belgian Government for information concerning the Inland Navigation of Canada. (Canada) (E.)
5. **Cadart,** G. — Note on the breakdown of the hydraulic lift at Anderton and its cause, followed by a translation of the report by Mr. Edwin Clerk on the subject. (France) (F.)
6. **de Mas,** B. — Note on a moveable bridge, termed oscillating bridge, constructed at the lock « de Dames » on the Nivernais canal. (France) (F.)
7. **Dupuy de Lome.** — Haulage by means of endless chains. (France) (F.)
8. **Jacquier,** J. — Note on a scheme for an inclined plane for vessels. (France) (F.)
9. **Viansson,** L. — History of the canal de l'Est (1874-1882). (France) (F.)

N. B. — (1) The name of a country in brackets coming after the title of a report, refers to the nationality of the writer.

(2) The letters E and F, in brackets, refer to the language in which the report was published, (E.) signifies English, (F.) signifies French.

10. **Zède.** — Haulage by means of endless chains. — Experiments carried out on the Rhone. Commercial results. (Presented by Mr. de Fréminville. (France) (F.)

11. **Rigoni,** J. — Note on the different methods of traction on waterways. (Italy) (F.)

12. **Huet,** A. — Whether the expense of construction of a canal increases in the same ratio as its cross-sectional area in a given subsoil? What types of canal should be adopted? (Holland) (F.)

13. **Huet,** A. — What are the best methods of feeding the upper reaches of canals designed for inland navigation? (Holland) (F.)

VARIOUS PUBLICATIONS :

14. *Guide-Programme* of the first International Congress of Inland Navigation. Brussels 1885. (F.)

15. *Report of the proceedings of the Sittings of the first Congress.* (F.)

16. *Report of the delegates of the Ministry of Public Works of France on the proceedings of the Congress at Vienna.* Paris, 1888. Prefaratory note by Mr. Voisin-Bey on the first Congress held in Brussels in 1885. (F.)

CONCLUSIONS

ADOPTED BY THE Ist CONGRESS

FIRST QUESTION. — **What are the conditions necessary for a ship canal to be of value, in other words, for the advantages obtainable to be sufficient to compensate the expense entailed in the construction and maintenance of the canal?**

(The term canal is used in a general sense and is applicable to rivers whose course has been so improved as to allow of navigation.)

CONCLUSIONS ADOPTED :

Taking into consideration the fact that the primary and economic conditions requiring the construction of a canal do not in any way differ from those of any ordinary method of intercommunication, the necessary conditions for a waterway to be of value will be:

The existence of sufficient quantities of weighty raw materials requiring to be carried considerable distances, or between important producing and consuming centres, and of various materials up to now without existing means of transport, owing to their low value.

The construction of a canal must evidently depend on there being a great demand for one, when the question arises of linking up two already existing waterways carrying a considerable traffic.

SECOND QUESTION. — **Is it desirable that all inland canals should belong to the State?**

CONCLUSIONS ADOPTED :

The Congress is of opinion that with regard to this question it is impossible in so short a time to answer it satisfactorily.

It would be necessary in replying to this question to take into account the very complex and different conditions which exist in each country, especially with regard to the position of the State as regards the regulations governing the railways, conditions far too vast and diverse to be settled in the short time remaining for discussion.

THIRD QUESTION. — **Is it adviseable to apply to all inland canals the principle of freedom from tolls, such as exists on the Lake Erie canal and the canals belonging to the French Government?**

CONCLUSIONS ADOPTED :

As regards this question, the Congress is of opinion that, except in particular instances which must always be allowed for, freedom from tolls must not be demanded on principle:

(1) because it is unnecessary;
(2) because it may be harmful;
(3) because it is not equitable.

FOURTH QUESTION. — **Does the cost of construction of a canal in a given subsoil increase in proportion to the area of its cross section? What types of canal should be adopted?**

CONCLUSIONS ADOPTED :

So far as inland, not maritime, navigation is concerned, the Congress is of the opinion that vessels should be sure of finding on all lines of inland navigation, locks having an available length of at least 38.50 m., a width of 5.20 m. and a depth of water of 2.00 m. on the mitre sills, and bridges having a clear height of at least 3.70 m. above the surface of the water. These dimensions are the ones adopted in France for the general system of navigable highways.

So far as maritime canals reaching inland are concerned, the Congress considers that the tonnage of the ships to be admitted and, consequently, the dimensions of the locks, should be determined mainly by commercial and local conditions. As to the

general cross sections of canals of every kind, they should be proportional both to the cross section of the locks and to the speed of the vessels.

FIFTH QUESTION. — **Which are the best machines in use for canal construction?**

CONCLUSIONS ADOPTED :

The methods of construction of a canal vary according to the nature and the quantity of the materials to be excavated.

In soil composed of sand and coarse gravel, the Congress advises the use of excavators, fitted with endless band transporters; it specially calls attention to a recent improvement which allows of the excavation of a trench four metres (about 4 1/3 yds. English) in width, without breaking up the track. In loamy or sandy soil or in river deposits, where but little gravel is met with, the dredger working under water appears preferable. In this case the removal of the dredged material may be economically carried out by dilution with a large quantity of water, which is got rid of on the depositing ground, either by pouring it through a long pipe, or by pumping it out by means of a rotary pump. In the case of mud and very soft soil, a suction pump may be used. To facilitate the disintegration of the soil, a jet of water played on the ground, in close proximity to the mouth of the tube, may be used, or a rotary screw revolving on an axis parallel to the tube, or a toothed wheel worked by an endless chain.

The Congress also calls attention to the value of tank dredgers, suction pumps carried on tank vessels, clam-shell dredgers, valve tank barges, etc.

SIXTH QUESTION. — **Which are the best methods of construction for the retaining walls of wharfs and docks ?**

CONCLUSIONS ADOPTED :

When firm ground is met with at a depth not exceeding 10 metres (about 5 fathoms) beneath the level of the water, the

usual system of foundation is to lay a mass of concrete blocks in an enclosure formed by stakes and timbering. When the foundations can be laid on rock, bottomless caissons are generally used, their extremities resting on the rock, or else an enclosure of timbering, held up by iron rails driven into shot holes which have been drilled in the rock.

When the soil is only partially firm, and is met with at a depth of from 15 to 20 metres, the foundations are laid on piles, which have been headed either with gratings or by masses of concrete. Frequently a bed of planking is laid on the piles, which is fixed at a slight depth beneath the water and which carries the retaining wall and the embankment. The space between the piles remains empty between the under side of this planking and a slope of rough stone or embankment reaching to the footing of the wall. In such a case a continuous wall is frequently replaced by a succession of arches perpendicular to the river.

In muddy soils, rectangular caissons supported on a scaffolding have been succesfully used, these caissons are gradually lowered as the interior is cleared out.

When firm ground is found at a depth of 15 to 25 metres below the level of the water, the safest and most economical method is to drive in the piles by means of compressed air, the piles being arranged either in a continuous row, or separate from each other and joined by arches of from 8 to 12 metres span.

In seas with little or no tide, artificial blocks of concrete are used, which are grounded on masses of rough unlaid blocks; these blocks the size of which was formerly about 10 cubic metres, are now frequently made as large as 100 to 160 cubic metr s.

SEVENTH QUESTION. — **What are the best means for consolidating the banks so as to allow operating at high speed.**

CONCLUSIONS ADOPTED :

In the case of small steamboats running at high speed, it may be useful to use risberms (ledges) placed from 0.30 m. to 0.50 m. below the ordinary water level and planted with reeds, willows, etc. The changes in level of the surface of the water must not be very great.

In the case of operating at high speed with large vessels, the only method seems be a revetment of artificial or natural stone blocks. The risberms should be placed, in this case, at a depth of about one metre below the water. The stone revetments rest on a row of piles or sheeting piles.

The stone revetment of the risberms might be done away with by placing the latter at a depth of at least two metres below the surface of the water and by constructing the stone revetments of the slopes with the greatest possible care.

This mode of construction involves rather a steep slope, 1/1 for example.

When it is possible to do so, it seems adviseable to plant trees or bushes on the slopes of maritime canals intended for high speeds, down to a certain depth below water.

EIGHTH QUESTION. — **Which are the different systems of working canals, more especially from the point of view of traction?**

CONCLUSIONS ADOPTED :

The Congress suggests that, either with assistance from the State, or by means of international aid, the necessary experiments should be carried out, for by such means alone can a full light be thrown on so complex a subject.

The Congress considers that it is adviseable to assist any serious attempt to grapple with the solution of so important a problem, whether it be by means of specially shaped vessels, or by means of some system of traction, which would free canals in the future of their principal failing : « their extreme slowness as a means of transport. »

NINTH QUESTION. — a) **What are the advantages of the different systems of locks?** —

CONCLUSIONS ADOPTED :

The Congress considers: 1. that the simplicity of their construction, the long experience which has consecrated their use,

their easy maintenance and handling by men who can be found everywhere, and, finally, the possibility of using them even, when they have reached a certain stage of decay, form indisputable advantages in favor of locks; 2° that mechanical means should be resorted to only with many reservations, for the following reasons:

1. Mechanical apparatus has not yet proved its advantages, at least as regards vessels of 250 to 300 tons (1).

2. Difficulties of construction, especially as regards lifts, seem to have reached the limit of the means which commerce has now at its disposal. In this connection, inclined planes seem preferable, and it would be interesting to see an application of these latter for vessels of 250 to 300 tons.

3. The life of these appliances is as yet unknown.

4. A special personel, difficult to bring together and to superintend, is needed to operate them.

5. The least injury may cause a complete stoppage of navigation.

6. So far as increasing the capacity for traffic is concerned, the advantage of mechanical means as compared with flights of locks is greatly lessened if two flights be placed side by side.

b) **What is the greatest allowable lift? —**

CONCLUSIONS ADOPTED :

The Congress considers that the greatest height which can be given to the lift is determined, in each special case, by the nature of the soil on which the foundation is laid. In soils where leakage is to feared, lifts of 1.50 m. to 2.20 have been used without trouble, as in Holland. For other kinds of soils, the limits reached in France, and which have exceeded 5 metres, have given no trouble when there was a sufficient water supply.

---

(1) See IXth Congress, Dusseldorf 1902, and Xth Congress, Milan 1905.

c) **What are the advantages of locks set side by side?**

CONCLUSIONS ADOPTED :

The Congress is of the opinion that it is advantageous to set locks side by side:

1°. — When an active circulation of vessels of different types has to be served.

2°. — When the traffic capacity of a canal has to be increased, one lock of each pair being used for up traffic and the other for down traffic.

In this latter case, the existence of pairs of locks allows the trouble caused to navigation, by any suspension of operations, to be reduced.

INTERNATIONAL CONGRESS

OF

INLAND NAVIGATION

II^nd^ Congress

Vienna 1886

PROGRAMME OF THE PROCEEDINGS OF THE CONGRESS

FIRST SECTION

FIRST QUESTION. — **The study of waterways from the economic point.**

Cost of freight on inland waterways compared with cost on rail — advantages and disadvantages of transport on each of the above systems — influence of cold weather and the slowness of circulation on transport by water — transport by water of raw materials, of heavy goods, etc., — influence of fiscal tarifs on the increase of existing traffic and the development of new branches of traffic — construction of new artificial waterways — suggestions.

SECOND SECTION

SECOND QUESTION. — **Normal profiles of canals and dimensions of structures pertaining to artificial lines of inland navigation.**

Statistics of the dimensions of inland waterways — their advantages and disadvantages — main and intermediary waterways — importance of a uniform type — suggestions.

THIRD SECTION

THIRD QUESTION. — **The methods of operating navigable highways.**

Present organisation and possible improvements — monopoly versus free choice of method of towing — suggestions.

FOURTH SECTION

FOURTH QUESTION. — **The construction of ship-canals. — Their utility.**

Historical — new schemes — suggestions.

NAMES OF THE REPORTERS

AND

TITLES OF THE REPORTS SUBMITTED TO THE IInd CONGRESS

QUESTIONS.

FIRST SECTION

First Question. — *The study of waterways from the economic point.*

1. **Sympher,** L. — On the economic importance of inland waterways. (Germany) (G.)

2. **Peez,** A. — On the economic value of inland waterways. (Austria) (G.)

SECOND SECTION

Second Question. — *Normal profiles of canals and dimensions of structures pertaining to artificial lines of inland navigation.*

3. **Schlichting,** J. — Normal profiles of inland canals, and dimensions of structures on artificial inland waterways. (Germany) (G.)

4. **Holtz,** P. — Normal profiles of canals and dimensions of structures pertaining to artificial inland waterways. (France) (F.)

N. B. — (1) The name of a country in brackets coming after the title of a report, refers to the nationality of the writer.

(2) The letters F. and G., in brackets, refer to the language in which the report was published. (F.) signifies French, (G.) signifies German.

THIRD SECTION

THIRD QUESTION. — *The methods of operating navigable highways.*

5. **Schromm,** A. — Organisation of the system of operating inland navigation. (Austria) (G.)

6. **Marchetti,** C. — Organisation of the system of operating inland navigation. (Austria) (G.)

FOURTH SECTION

FOURTH QUESTION. — *The construction of ship-canals — Their utility.*

7. **Cobert,** A. — The utility of ship-canals. (Belgium) (F.)

COMMUNICATIONS. (1)

8. **Tscharnomsky,** W. — Remarks on the cost price of transport of goods per ton-kilometre, on the Marie waterway system. (Russia) (F.)

9. Monographs on the Danube and the Elbe. (G.)

VARIOUS PUBLICATIONS.

10. *Illustrirter Donau-Führer, von Passau bis Sulina.* Vienna, 1886. (G.)

11. *Discussions and resolutions of the Congress.* Vienna, 1887. (G. F.)

---

(1) Whereas the **reports** are written by specialists who have been invited to write a paper on a given subject, with a view to its forming the basis of a discussion, the **communications** are papers submitted by their authors on their own initiative on subjects which do not appear on the programme of the Congress.

12. *Paper communicated to the Society of Civil Engineers of France*, by Mr. Fleury, 2nd und 16th July. 1886. (F.)

13. *Reports of the delegates of the Ministry of Public Works of France on the proceedings of the Congress.* Paris, 1888. (F.)

CONCLUSIONS

ADOPTED BY THE IInd CONGRESS

FIRST SECTION

FIRST QUESTION. — **The study of waterways from the economic point.**

CONCLUSIONS ADOPTED :

The Congress is of opinion that the economic importance of artificial waterways, as regards, more especially, the interchange of goods, is so considerable, that it is adviseable, even where railways already exist, to construct artificial waterways in suitable districts, and to fit them with all the necessary equipment suited to the requirements of modern traffic. The accessory advantages, particularly from the point of view of the draining and irrigation of the surrounding districts, may often be an aid to the construction of such works.

To be able to completely appreciate the economic value of inland waterways, it is most desirable *that the statistics concerning them should be most complete and drawn up in a practical manner.*

The Congress proposes that this question be placed on the agenda for consideration at the next meeting of the International Congress of Inland Navigation.

SECOND SECTION

SECOND QUESTION. — **Normal porfiles of canals and dimensions of structures pertaining to artificial lines of inland navigation.**

CONCLUSIONS ADOPTED :

First proposition. — The Congress proposes the following minimum dimensions for artificial navigable highways carrying a heavy traffic :

1. — Main canal lines.

	Metres.
1. Ratio between the wetted section of the boat (drawing 1.75 m. of water) and the wetted section of the canal	1 to 4
2. Normal depth of water :	
a) on the line generally	2.00
b) under bridges, in canal bridges and in masonry prisms of tunnels	2.50
3. Width of bed (measured on the bottom):	
a) on tangents and generally	16.00
b) on curves, this width should be increased by twice the versed-sine of the arc of which the chord is the greatest length of the boat.	
c) under bridges (double line)	16.00
d) in canal-bridges and tunnels (single line)	7.50
4. Clear height under bridges and in tunnels, taken above the surface of the water:	4.50
5. Dimensions of locks:	
a) depth of water on mitre sills	2.50
b) clear width between lock walls	7.00
c) clear length of the lock, measured from the chord of the upper lift wall and the beginning of the lower gate recess	57.50

2. — Canalized Rivers.

6. The normal profiles and the dimensions of the structures required should at least be those adopted for the main canals.

Second proposition. — The Congress expresses the wish that existing canals, in direct contact with the canals of adjoining countries and having dimensions less than those of these latter, be enlarged so soon as possible.

THIRD SECTION

THIRD QUESTION. — **The methods of operating navigable highways.**

CONCLUSIONS ADOPTED :

1. — It is desirable that a regular traction service be organized on canals, either by the State or by private industry. The necessary measures should be taken to prevent free towing from interfering with the operation of this regular traction service. This object will be attained both by regulations of the navigation police and by the establishment of suitable technical arrangements (turn outs, moorings, signal service, etc.).

There is no reason for granting a monopoly with the suppression of freedom of navigation : freedom of navigation should not be restricted except in so far as may be necessary to guarantee the security of the public traction service.

The dimensions of canals will be fixed in accordance with the preceding conditions.

2. — There seems to be neither any necessity nor even any use for introducing on rivers any restriction of the existing freedom of towing.

Tow-boats and tugs must continue to be allowed to circulate freely as they do now, and the rates for towing should be allowed to be settled freely.

3. — It seems desirable to establish, on open rivers, canalized rivers and canals, and alongside of the public traction service and private navigation, associations of boatmen, with a view to transporting goods which, by their character, are not generally shipped in full cargoes but nevertheless are sent over great distances. The shipping would be by order of priority as the goods arrive at the port of shipment.

4. — A rapid development of storehouses and sheds is highly important for the extension and prosperity of inland navigation.

In constructing these storehouses, attention should be paid to the installation of the best means for trans-shipment so as

to insure the most direct handling possible of freight, and especially of grain, by the use of mechanical appliances.

It is equally necessary that the trans-shipment of freight be facilitated between railways and waterways.

5. — The grain trade of Europe will greatly assist inland navigation and the construction of warehouses, by the introduction of a uniform classification of grain. This classification will give to European agriculture better means to hold its own in the markets of the world.

6. — The construction of public harbors of refuge for winter is an absolute necessity for inland navigation. When carrying on works for the improvement of rivers, it is well, when the exigencies of climate allow, to take into account the necessity for so constructing these harbors of refuge, and for so arranging everything, that they can be gradually enlarged with the successive developments of traffic.

Attention should also be paid to keeping the entrances to natural harbors of refuge always in good condition. Finally, harbors of refuge, whether natural or artificial, should be so arranged, in localities where the need may be felt further on, that they can be transformed later into commercial ports.

7. — The commercial codes which now govern inland navigation are insufficient. It is indispensable that they be completed by suitable developed legislation.

FOURTH SECTION

FOURTH QUESTION. — **The construction of ship-canals. — Their utility.**

CONCLUSIONS ADOPTED :

After a long and animated discussion, this question was adjourned to the next Congress of Inland Navigation.

———

INTERNATIONAL CONGRESS

OF

INLAND NAVIGATION

III^rd^ Congress

Frankfort on Main 1888

PROGRAMME OF THE PROCEEDINGS OF THE CONGRESS

QUESTIONS.

First Question. — **Revision of the statistics relating to inland navigation.**

Second Question. — **Improvements in the navigability of rivers.**

Third Question. — **Which are the vessels and methods of traction best suited to the conditions of the great navigable highways?**

Fourth Question. — **What are the economic advantages of ship-canals which penetrate into the interior of a country?**

The members of the Congress divided themselves up into three sections. The first section undertook the examination of Questions 2 and 3. The second section took charge of Questions 4 and 6, and the third section discussed the 1st and 5th Questions.

FIFTH QUESTION. — **The utility of canalizing rivers and the construction of waterways, from the point of view of agriculture.**

SIXTH QUESTION. — **The estuaries of rivers, their suitability for navigation, and their maintenance.**

NAMES OF THE REPORTERS

AND

TITLES OF THE REPORTS SUBMITTED TO THE IIIrd CONGRESS

QUESTIONS.

FIRST QUESTION. — *Revision of the statistics relating to inland navigation.*

1. **Von Studnitz,** A. — Statistics of inland navigation. (Germany) (G.)

2. **De Sytenko,** N. — Revision of the statistics relating to inland navigation. (Russia) (G.)

SECOND QUESTION. — *Improvements in the navigability of rivers.*

3. **Wallandt,** E. — Improvements in the navigability of rivers. (Germany) (G.)

4. **Schlichting,** J. — Improvements in the navigability of rivers. in their tidal reaches. (Hungary) (G.)

THIRD QUESTION. — *Which are the vessels and methods of traction best suited to the conditions of the great navigable highways?*

5. **Dill,** C. — Which are the vessels and methods of traction best suited to the conditions of the great navigable highways. (Germany) (G.)

N. B. — (1) The name of a country in brackets coming after the title of a report, refers to the nationality of the writer.

(2) The letters E, F. and G, in brackets, refer to the language in which the report was published (E.) signifies Englisch, (F.) French and (G.) German. The first letter in the bracket indicates the language in which the original report was written.

6. **Melchers,** P. — Which are the vessels and methods of traction best suited to the conditions of the great navigable highways? (Germany) (G.)

FOURTH QUESTION.— *What are the economic advantages of ship canals which penetrate into the interior of a country?*

7. **Cobert,** A. — Under what conditions is the construction of canals for bringing ocean-going vessels to inland ports justified from the point of view of political economy? (Belgium) (F.G.)

8. **Leader-Williams,** E. — Under what conditions is the construction of canals for bringing ocean-going vessels to inland ports justified from an economic point of view? (Great-Britain) (E.G.)

FIFTH QUESTION. — *The utility of canalizing rivers and the construction of waterways, from the point of view of agriculture.*

9. **Hagen.** — On the utility of rendering rivers navigable and the construction of canals, from the point of view of agriculture. (Germany) (G.)

10. **Thiel,** H. — On the utility of rendering rivers navigable and the construction of canals, from the point of view of agriculture. (Germany) (G.)

11. **de Mas,** F.-B. — On the advantages to agriculture of canalising rivers and the construction of canals. (France) (F.G.)

12. **Philippe,** L. — On the utility of rendering rivers navigable and the construction of canals from the point of view of agriculture. (France) (F.G.)

SIXTH QUESTION. — *The estuaries of rivers, their suitability for navigation and their maintenance.*

13. **Franzius.** — The estuaries of rivers, their suitability for navigation and their maintenance. (Germany) (G.)

14. **Reynolds,** O. — On certain laws relating to the regime of rivers and estuaries, and on the possibility of experiments on a small scale. (Great-Britain) (E.G.)

VARIOUS PUBLICATIONS :

15. *Programme-Guide.* Frankfort on Main. 1888. (G.F.)

16. *Führer durch Frankfurt-am-Main und Umgegend.* Frankfort on Main. 1888. (G.)

17. *Proceedings of the General Meetings and the Meetings of the Sections.* Frankfort on Main. 1889. (G.F.)

18. *Reports of the French delegates to the International Congress of Inland Navigation held at Frankfort on Main in 1888.* Paris. 1890. (F.)

CONCLUSIONS

ADOPTED BY THE IIIrd CONGRESS

First Question. — **Revision of the statistics relating to inland navigation.**

CONCLUSIONS ADOPTED :

1° In order to draw up statistics of inland navigation which are to be of any value, it is necessary to obtain :

a. A complete description and exact graphic statement showing clearly the waterways, the various structures belonging to them, and everything which is in any way connected with the working, together with full information as to the cost of construction and maintenance;

b. The description of, and the results of the most recent census of vessels making use of the various waterways;

c. Tables giving the traffic carried on the waterways in ton-kilometres, and thus allowing of exact comparison with railway goods-traffic.

2° In order to arrive at the above results, a Committee shall be formed consisting of members of the Congress, one member being selected from each of the Governments represented on the Congress.

This Committee, which shall have the right to co-opt members should it be found necessary to increase its membership, shall meet without delay and shall prepare a report for presentation at the forthcoming Congress.

Second Question. — *Improvements in the navigability of rivers.*

CONCLUSIONS ADOPTED :

1° The results hitherto attained by the regulation and canalisation of navigable rivers have considerably furthered the traffic on inland waters and have thus raised the economical value of these waterways.

2° The constantly rising need of communication, as well as the interests of national economy, claim as far as attainable, further improvements in the still deficient navigability of rivers.

3° It is thought necessary :

a. To determine by means of hydrotechnical researches the highest limit of navigability attainable for all such rivers, in which normal widths, empirically accepted long ago, are still maintained.

b. To strive, by means of experiments and observations in water-courses, and in trial-stations specially arranged for the purpose, to promote hydrotechnical science and to improve the constructions which have to do with navigation.

THIRD QUESTION. — *Which are the vessels and methods of traction best suited to the conditions of the great navigable highways?*

CONCLUSIONS ADOPTED :

The Congress expresses the wish to have practical and scientific trials carried on, under the direction of the governments interested in inland navigation, either with the assistance of the State, or by means of an international meeting, and in accordance with a prearranged programme, in order to determine what are the best shapes and proportions for boats for inland navigation; and what are the means of traction, whether they should form part of the vessel itself or be independent thereof, so as to best meet the three requirements of speed, regularity and economy.

FOURTH QUESTION. — *What are the economic advantages of ship-canals which penetrate into the interior of a country?*

The Congress decided unanimously that ship-canals penetrating into the interior of a country were of the utmost economic value. It is however impossible to formulate their advantages by means of figures, so as to obtain a general formula such as Mr. Gobert has attempted to arrive at in his paper.

CONCLUSIONS ADOPTED :

The Congress, although disagreeing with Mr. Gobert as to the correctness of his figures, agrees with the views expressed in his report.

FIFTH QUESTION. — **The utility of canalizing rivers and the construction of waterways, from the point of view of agriculture.**

CONCLUSIONS ADOPTED :

1° The regulation of rivers apart from facilitating the transport of raw products and manufactures is of the greatest advantage to the agriculturist, as it not only fixes the course and makes safe the banks of the river, but also considerably reduces the risk of its being blocked by ice.

2° In canalizing rivers and constructing canals all possible attention should be given to the improvement of the adjacent lands as far as this is possible without prejudice to the main object of the work, the construction of a convenient and efficient waterway. In preparing a scheme, therefore, the effect of the work on the present condition of the streams and underground supplies of water must be most carefully considered and every care must be taken to meet, so far as is possible, the special requirements of the agriculturist.

3° With a view to developing the transport of agricultural produce on canals, it is adviseable that access to the canal should be as free as possible.

SIXTH QUESTION. — **The estuaries of rivers, their suitability for navigation, and their maintenance.**

RESOLUTIONS ADOPTED :

1° The Congress thanks Professor Osborne Reynolds and Mr. Vernon-Harcourt for their interesting communications on the subject of the experiments they carried out with *small scale*

models, in view of the determination *a priori* of the effect of certain works designed for an estuary.

The Congress is of opinion that the development and general use of the method proposed by Professor Reynolds is of the utmost interest.

2° The Congress, fully appreciating the exactitude of the thesis, which Mr. Franzius put forward, both in his paper and verbally, agreed with the views expressed in his report.

N. B. — The following conclusions formulated by Mr. Franzius could not be put to the vote owing to their being of too general a character, and owing to the number of questions involved, the discus-cussion of which would have covered too considerable a ground.

1° It is in every way advantageous to bring ocean-going vessels as far inland as possible; the most favorable conditions under which this can take place are offered by a river that is navigable for river-boats above the point of its course attainable by ocean-going ships. Hence the importance of rendering estuaries navigable;

2° The utility of estuaries for navigation purposes is more dependent on the presence of considerable flood- and ebb-tides than on the size of the river. Generally stated, the larger a river and the greater the amount of matter it carries in suspension, the greater must be the tidal fluctuation in order to prevent the formation of banks detrimental to navigation;

3° Estuaries without marked tidal fluctuation can in most cases only be rendered navigable by narrowing—in and keeping together the fixed and non—increasable amount of flow in all reaches where the formation of branches or deltas is to be feared, and by then carrying it out to deep water between training banks or jetties. Should a natural lagoon, separated from the sea, and filling and emptying under the influence of varying winds, exist close above the lowest reach, or at the point where the river proper flows into the estuary, this can be utilized for obtaining a greater depth for the lower reach (the estuary proper) than is attainable above;

4° Estuaries having high tides may be rendered navigable by increasing the quantity and velocity of the tidal column as far as possible. The estuary proper (considered from tide-end to the open sea) should therefore regularly increase in breadth in the shape of a funnel. The average velocity however in the main stream or in the low-water channel must not be permitted to diminish for fear of the formation of a bar.

The low-water channel should be uniform, carried along on bold lines and as far as possible bounded on each side by a low training-wall; on the other hand large surfaces should be reserved for the reception of flood water during high floods.

NOTE.

At its final meeting, the Congress unanimously adopted the following resolution :

"The Congress proposes to include among the questions to "be submitted to the next Congress, that of tolls or taxes, both "as regards rivers and navigable canals and as regards the "inland ports situated along their course."

INTERNATIONAL CONGRESS

OF

INLAND NAVIGATION

IVth Congress
Manchester 1890

PROGRAMME OF THE PROCEEDINGS OF THE CONGRESS

FIRST SECTION

Works entailed and management.

First Question. — **Inland rivers and canals.**

Description of the various systems of waterways; methods of traction and propulsion on canals; methods of strengthning the banks of waterways.

Second Question. — **1. Tidal Rivers. Improvement of estuaries and river-mouths. — 2. Ship-canals.**

Note. — The members of the Congress will divided up into four sections A, B, C and D which will respectively undertake the examination and criticism of one or other of the four questions on the programme of the Congress.

SECOND SECTION

Commercial and Economic questions.

THIRD QUESTION. — **Statistics concerning inland navigation.**

Consideration of the report of the International Statistical Committee appointed by the IIIrd Congress of Inland Navigation at its meeting at Frankfort on Main. 1888.

FOURTH QUESTION. — **Present position, system of management and working costs of canals.**

NAMES OF THE REPORTERS

AND

TITLES OF THE REPORTS SUBMITTED TO THE IVth CONGRESS

FIRST SECTION

Working and management.

FIRST QUESTION. — *Inland rivers and canals.*

1. **Saner,** J. A. — The River Weaver navigation, 1721-1890. (Great-Britain) (E.F.)

2. **Bartholomew,** W.-H. — Aire and Calder navigation. (Great-Britain) (E.F.)

3. **Marten,** H. J. — The present condition and development of inland waterways. (Great-Britain) (E.F.)

4. **Rhodes,** J. H. — On current canals. (Great-Britain) (E.)

5. **Fleming,** S. — The waterways of Canada. (Canada) (E.)

6. **de Sytenko,** N. — A general sketch of the navigable waterways of Russia, their condition, management, maintenance, cost of working and possibilities of improvement. (Russia) (F.E.)

7. **de Hoerschelmann,** E. — The reorganisation of the Marie fluvial system (canal from the Volga to the Neva). (Russia) (F.E.)

N. B. — 1. The name of a country in brackets coming after the title of a report, refers to the nationality of the writer.

2. The letters E, F and G, in brackets, refer to the language in which the report was published. (E.) signifies English, (F.) French and (G.) German. The first letter in the bracket indicates the language in which the original report was written.

8. **de Timonoff,** V. E. — The river Volga. Short hydrographic account thereof. (Russia) (F.E.)

9. **Kwitzinsky,** L. — On the improvements that may be effected in the navigability of rivers. (Russia) (F.E.)

10. **Fontaine,** G. — Lock of 20 metres fall. (France) (F.E.)

11. **Flamant,** M. A. — Note on a system of inclined pane for boats. (France) (F.E.)

12. **Bailey,** W. H. — Notes on canal-boat propulsion. (Great-Britain) (E.F.)

13. **Lévy,** M. — Means of traction and propulsion on canals and rivers. (France) (F.E.)

14. **Lévy,** M. — Historical and technical account of cable haulage. (France) (F.E.)

15. **Wells,** L. B. — The protection of banks of waterways against the effects of the wash of steamers. (Great-Britain) (E.F.)

SECOND QUESTION. — 1. *Tidal Rivers. Improvement of estuaries and river-mouths.* 2. *Ship-canals.*

16. **Vernon-Harcourt,** L. F. — The physical conditions affecting tidal rivers; and the principles applicable to their improvement. (Great-Britain) (E.F.)

17. **Reynolds,** O. — The action of tides on estuaries. (Great-Britain) (E.F.)

18. **Wheeler,** W. H. — The principles of improving tidal rivers. (Great-Britain) (E.F.)

19. **Schönberg,** A. C. — On dredging and dredge plant. (Great-Britain) (E.)

20. **Williams,** E. L. — The Manchester ship canal. (Great-Britain) (E.F.)

21. **Menocal,** A. G. — The Nicaragua canal : its design, final location, and work accomplished, 1890. (United States) (E.)

22. **Saint-Yves,** A. — The Corinth Canal. (France) (F.E.)

23. **Crawford,** J. L. — Paper on the proposed Forth and Clyde direct-route ship canal. (Great-Britain) (E.F.)

24. **Stevenson,** D. A. — Notice regarding the proposed Forth and Clyde ship canal. (Great-Britain) (E.F.)

25. **Hurtzig,** A. C., and **Bailey,** W. H. — On a recorder for indicating the velocity and quantity of water pumped into the Alexandra dock, Hull, for maintaining its level. (Great-Britain) (E.F.)

SECOND SECTION

Commercial and Economic questions.

THIRD QUESTION. — *Statistics concerning inland navigation.*

26. **Schlichting,** J. — The improvement of the statistics of inland navigation. Report of the Commission. (Germany) (G.E.F.)

27. **Sympher,** L. — An account of the intercourse on German waterways for the years 1875 and 1885. (Germany) (G.E.)

28. **Dufourny,** A. — Statistics of the position, management, and expenses of construction and maintenance of the waterways of Belgium. (Belgium) (F.E.)

FOURTH QUESTION. — *Present Position, System of Management and Working Costs of canals.*

29. **Ströhler,** C. — The Improvements and Condition of Trade on the Oder. (Germany) (G.E.)

30. **Clements,** E. — Inland navigation in the United Kingdom : its present position as regards traffic, capacity, and finance, and the various means suggested for its improvement. (Great-Britain) (E.F.)

31. **de Llaurado,** A. — Inland Navigation in Spain. (Spain) (F.E.)

32. **Holtz,** P. — Condition, working, and expenses of navigable roads in France. (France) (F.E.)

33. **Bompiani,** G., and **Luiggi,** L. — Management and working costs of the inland waterways of Italy. (Italy) (F.G.)

34. **Bompiani,** G. — Management and expenses of working of inland navigation in Italy. (Italy) (E.)

35. **Van der Sleyden,** Ph. W. — Present position and management of the waterways of Holland. (Holland) (F.)

36. **Lindgren,** A. M. — Report on the canals of Sweden. (Sweden) (F.E.)

37. **Jeans, J. Stephen.** — On the cost of coal transport and the mutual influence of railways and canals. (Great-Britain) (E.F.)

VARIOUS PUBLICATIONS :

38. *Programme of the arrangements and map of Manchester,* etc. (E.)

39. *Report of the proceedings of the Congress.* Manchester, 1890. (E.)

40. *Reports of the French delegates to the International Congress of Inland Navigation, held in Manchester in 1890.* Paris, 1892. (F.)

CONCLUSIONS

ADOPTED BY THE IVth CONGRESS

FIRST SECTION

Works entailed and management.

First Question. — **Inland rivers and canals.**

CONCLUSIONS ADOPTED:

The interesting reports sent to the Congress, on the navigation of the Weaver and Volga were discussed, as was also a report upon a system of towing. No conclusions were submitted to a vote.

Some important questions relating to transportation on canals were also considered. It was unanimously agreed that the construction of canals is relatively economical, but that the cost of maintenance is at times large, especially when this cost arises from protecting the banks against the erosive action of the waves raised by the passage of steamboats. This cost exerts an influence, necessarily, on the cost of transport by water, and it is hard to completely satisfy the public which tends toward demanding constantly smaller prices.

By reason of the variable nature of the sub-soil through which canals pass and of the difficulty of finding in certain districts the necessary stone materials, the Congress did not arrive at any decision in regard to this question of the defence of banks.

Second Question. — **1. Tidal Rivers. Improvement of estuaries and river-mouths. — 2. Ship-canals.**

CONCLUSIONS ADOPTED:

1. In the course of the discussion, a number of members recommended the arrangement of an estuary or river-mouth in the shape of a funnel, and as regards tidal rivers a gradual widening of the channel as it reaches the sea.

It was specially recommended that a study should be made of the bed of the river and the permanency and depth of the main channel. Some members recommended, citing exemples, the construction of dykes converging on the river mouth. Others were of opinion that it is impossible to lay down general rules on these questions, insomuch as the solution of the problem is influenced by many various matters, which vary according to local conditions.

2. The section carefully considered the report on the construction of the Manchester ship-canal, and proposed that the following resolution should be adopted by the Congress:

While canals without locks are usually adviseable in the case of ship-canals, taking into consideration the special local circumstances arising in the case of the Manchester ship canal, the use of locks was in this case perfectly rational and justified.

SECOND SECTION

Commercial and Economic questions.

THIRD QUESTION. — **Statistics concerning inland navigation.**

(Consideration of the report presented by the International Statistical Committee.)

The Congress accepts the statistical principles relating to inland navigation, as given in the following paragraphs 1, 2 and 3 of the report of the International Statistical Committee and recommends that they should be adopted for future use.

§ 1. *Statistics of international navigation should include:*

A. Statistics of Navigable Waterways.
B. Statistics of Vessels.
C. Statistics of Traffic.
D. Statistics of Accidents.

§ 2. *The statistical returns should include* (reserving the power of furnishing supplementary particulars in accordance with the special circumstances of each country).

A. — Statistics of navigable waterways.

a) Memoranda on the various waterways, classified according to their nature (improved or canalised rivers, canals, inland lakes) containing:

1. Hydrography (area of drainage, climate, situation, affluents, water-supply, depth of water, quantity of water, fall, speed, detritus, breaking up of ice, hydrometric scales).

2. Embankments, protection of the banks, tow-paths.

3. Navigability and navigable connections (channels, depth of water, signals, traffic stations, sections).

4. Ports, loading and discharging places and platforms, quays (apparatus for loading and discharging).

5. Bridges and ferries.

6. Method of rendering the ways navigable (works of regularisation, dams, locks, tunnels).

7. Cost of construction and maintenance, revenue from tolls.

8. Navigation of vessels and timber rafts. Mode of working.

9. Traffic and nature of goods constituting it. Average price of transport.

10. Shipbuilding establishments.

11. Telegraph and telephone cables.

12. Customs and police regulations.

13. Management.

14. Authorities in charge.

b) Plans to scale of the navigable waterways, showing works and provisions for navigation.

c) Longitudinal sections to scale, and some cross sections.

d) Tabular statements, giving the following particulars, which are essential to navigation, classed according to navigable waterways. All measurements to be given according to the metric system.

1. Nature and type of waterways, whether regularised or canalised river, canal, inland lake.

2. Length of portion navigable for steamers, sailing vessels and rafts. Distance between principal stations.

3. Width of channel when normally full and when water is at medium and at lowest level.

4. Minimum depth of the channel when normally full and at medium and lowest levels.

5. Minimum, medium and maximum fall.

6. Situation, description and distances apart of bridges. Their width and freeway underneath at low, medium and high states of water. Time necessary for opening and shutting.

7. Situation, description and distances between locks. Length and breath available, capacity, depth of sill below normal water level. Normal time occupied in locking, and time during which locking is forbidden.

8. Situation, description and width of tunnels, available width, and available height above normal water level.

9. Situation, description and dimensions of ports, fire stations, loading and discharging places and quays.

B. — Statistics of vessels.

a) Register of vessels; that is, descriptive list, arranged according to waterways, of home and foreign vessels having a capacity of over five tons, and also showing specially:

1. Place of registry, denomination, property, manning, number, name, proprietor, captain, crew.

2. Description of vessel.

(Steamer, whether paddle or screw; for passengers, goods or both; tugs, towers, whether by chain or wire rope, vessels towed by tug or tower by means of ropes; sailing vessels; rowing vessels hauled by rope).

3. Construction.

Place and time of construction and repairs. Material of construction, dimensions, capacity, number of tons of cargo capacity per centimetre of draught, motive power, propulsive mechanism.

4. Equipment.

Mechanism for anchoring, for extinction of fires, for loading and discharging. Life saving and protecting appliances.

b) Tabular statement, arranged according to waterways, giving the following information necessary for navigation of vessels.

1. Where from.

2. Number.

3. Name.
4. Proprietor's name and address.
5. Captain.
6. Description (type) of vessel.
7. Where built and repaired.
8. Date of building and repairs.
9. Material of which constructed.
10. Length over all.
11. Beam.
12. Total depth, and height above water level, empty and loaded.
13. Draught of water, empty and loaded.
14. The coefficient of displacement when loaded. (The actual displacement, or weight of water displaced by vessel, divided by the weight of a water cylinder having for its axis the greatest submerged length of the vessel's bottom, and the cross section of which is a circle equal in area to the greatest perpendicular cross section of the submerged part of the vessel.)
15. Capacity in tons of 1,000 kgs; if passenger vessel, after deduction of full complement of passengers.
16. Indicated horse-power, at 75 kgs per second.

C. — Statistics of traffic.

a) Tables arranged according to waterways, and to the following descriptions of traffic:

1. Local (interior) traffic.
2. Traffic forward, i. e. destined for other waterways.
3. Traffic received, i. e., coming from other waterways.
4. Transit.

giving the following particulars:

1° Length of navigable waterway.

2° Number of vessels conveying traffic, exclusive of ferries, dredgers, and vessels employed for works, tugs, and towing vessels, and of all vessels of less than five tons capacity.

3° Quantity of goods conveyed, devided under the nine heads :

1° Fuel (coal, anthracite, coke, lignite, patent fuel charcoal, turf, petroleum, naphta, firewood).

2° Minerals, metals, salt.

3° Building materials, except wood (natural and artificial stone, cement, lime, trass, asphalt, glue, tar, earth, sand, colouring matters).

4° Raft wood, round timber, wood for building and other purposes, and worked timber. (Goods transported on rafts, and the materials of the rafts, to be shown according to their weights, separately from the traffic of vessels.)

5° Manures.

6° Metals and their products of all sorts, including machinery;

7° Manufactured goods (earthenware, pottery, chemicals, products of milling (except flour from grain), paper, wood pulp, grease, oils, hides, leather.

8° Agricultural produce (wheat, rye, barley, oats, rice, maize, flour prepared from grain, dried vegetables, beetroot and syrup, potatoes, vegetables, fruit, plants, seeds, oilseeds, oilcake, hay, straw, rushes, tobacco, wine, beer, alcohol, spirits of wine, hops, hemp, flax, yarn, cotton, jute, starch, wool, bark, tan, groceries, live, and dead catle, bones, fish).

9° Other goods (bale goods, casks, sacks, rags, etc.).

5. Quantity of goods, in tons, per kilometre. (Product of quantity given under par. 3 by distance travelled on the navigable waterway).

6. Average quantity of goods in tons. (The sum in par. 4, divided by the entire length of the waterway.)

7. Number of passengers carried.

8. Number of days in the year during which navigation is open, and the cause of interruptions.

b) Tables of traffic in the ports, arranged according to waterways, and showing:

1. Number of vessels working the traffic; steamers and sailing vessels to be separately shown.

2. Quantity of goods, in actual ton weight, divided into nine groups, as in (a) 3.

3. Average cargo of vessels, in tons.

4. Proportions in the total traffic, of goods arriving, departing, and in transit.

c) Tables of goods traffic on such navigable waterways and railways as can be compared with each other.

1. Length of waterways and of railway.
2. Quantity of traffic, in actual tons, divided into nine groups, as at (a) 3.
3. Qauntity of traffic, in tons, per kilometre.
4. Average quantity of goods, in tons.
5. Remarks.

D. — Statistics of accidents.

a) Tabular statement arranged according to waterways showing:

1. Day when the accident occured.
2. Place, and nature of waterway.
3. Number of the vessels or rafts injured.
4. Numbers of the vessels or rafts injured, names of owners and steersman; description of vessels or rafts.
5. Condition of waterway where the accident occured.
6. Nature of accidents.
7. Probable cause of accident.
8. Consequence of accident.
9. Estimated valuation of damage.
10. Detailed description of accident.

§ 3. *The statistical document (§ 2) should be published periodically.*

The Section after consideration and discussion of the reports submitted, and bearing in mind the proceedings and resolutions of preceeding Congresses, unanimously decided upon the following propositions, which were ratified by the Congress.

FOURTH QUESTION. — **Present position, system of management and working costs of canals.**

CONCLUSIONS ADOPTED :

1. Owing to the low cost of construction and maintenance of waterways, they form a valuable means for transporting large

masses at cheap rates, and should be the object of earnest attention on the part of the authorities concerned and of the State.

2. In order to secure cheap through-going transport, a system with uniform dimensions is essential.

3. The existence and development of railways and waterways together is desirable, first, because these two means of transport are the complement of each other and ought to contribute each according to its special merits to the public good; second, because from a broad point of view the industrial and commercial development which will result from the perfecting of the means of communication must in the end profit both railways and waterways.

4. The great value of waterways to the country at large, and the fact that they are feeders of, and supplementary to, railways justifies the State and public bodies in assisting as far as possible the construction and maintenance of waterways of uniform dimensions so as to encourage through traffic at low rates.

INTERNATIONAL CONGRESS

OF

INLAND NAVIGATION

V^th^ Congress

Paris 1892

PROGRAMME OF THE PROCEEDINGS OF THE CONGRESS

FIRST SECTION

Construction and maintenance of waterways.

First Question. — **Consolidation of canal banks.**

Means employed for consolidating canal banks in view of navigation at high speed. Results obtained. Cost. Influence of the width of waterways.

Second Question. — **Water consumption in canals. Its different elements. Variations of it with increase of depth.**

Different methods for procuring feeding resources : Springs, brooks, perennial-sources, reservoirs, machinery for raising water. Cost of water per cubic metre. Advantages and disadvantages of each of the methods.

Third Question. — **Leakage in canals.**

Different means of rendering canals water-tight; with sand, clay, layers of puddled clay, concrete. Cost of various methods; their efficacity, advantages and disadvantages.

FOURTH QUESTION. — **Reservoirs.**

Various types of reservoirs. Their methods of construction, by means of earth banks or masonry walls. Height and cross section of dams. Foundations. Method of execution of the work. Other works in connection with reservoirs; overflow basins, water catchments, drainers.

Special technical and working conditions attaching to reservoirs constructed to cope with various requirements. Disadvantages and advantages of using the same reservoir for feeding canals, irrigation purposes and factory supply.

SECOND SECTION

Technical Management.

FIFTH QUESTION. — **Stoppages on canals and canalized rivers.**

Stoppages caused to vessels by the carrying out of maintenance work in canals and canalized rivers along the line of the channel itself.

Usual date and duration of such stoppages. Circumstances which govern the period at which the work takes place; difficulties of filling the reaches; necessity for making arrangements for fair and market times; periods during which traffic on the canals is most dense.

Simultaneous and successive stoppages. Is it possible to fix on a uniform date for the commencement of the stoppage on all branches of the canal system, if not, what are the principles on which the succession of repairs is carried out.

Technical or working methods to be employed in order to reduce the length of the stoppage as much as possible.

SIXTH QUESTION. — **Traction on canals. — Traction on canalized rivers. — Traction on rivers of natural flow.**

Various systems of traction in use on each of the types of canal under consideration. Relationship between the system of traction and the type of waterway, viz :

1. *Technical considerations : Dimensions of the navigable channel, shape, state of the banks, currents, rise and fall of tide, stoppages, vessels and materials to be hauled, etc. Under what circumstances and limitations should the passage through of water intended for irrigation or factory purposes be allowed. Technical and financial examination of the question.*

2. *Working conditions; whether the traction plant should or should not be under the same ownership as the transport plant and the*

waterway; the loading and discharging plant of the ports must be taken into consideration, also the time lost, either as lay days or for other reasons, and the means of communication with neighbouring waterways.

3. Administrative conditions : police regulations and the terms of concessions often impose conditions which react on the system of traction.

Data regarding the economic results realised.

THIRD SECTION

Commercial working and economic questions.

Seventh Question. — Taxes and tolls on navigable waterways.

Taxes or tolls charged by the State on waterways managed by the Government. Description of the character of the tolls. Whether they simply form a tax on transport coming under the same head as any other tax in the budget? Is the sum received from such taxes or tolls specially set aside for the maintenance of waterways, for the carrying out of new works or improvements?

What form do these tolls take and what is the amount obtained therefrom?

Is there a special amount set aside for the expenses of working moveable structures such as locks, barriers, and swing bridges by day and night?

What reasons can justify the retention of such tolls, or can be urged in favour of their suppression in such countries as they exist in?

Eighth Question.—Conditions of administration of inland ports.

Conditions of administration governing the inland ports from the point of view of their construction, maintenance and management. The extent of their loading and unloading plant. Under what conditions is this plant available to the public? Linking up of the inland ports by means of railroads with the main lines of railway.

Ninth Question. — Respective roles of waterways and railways in the transport industry.

Definition of the respective roles of waterways and railways in the transport industry. Definition of the various kinds of traffic which pertain to each of these systems. Examination of the circumstances under which they come into competition and those under which they

assist each other. Distinction between parallel routes and routes at right angles.

Consequences of the proximity of two routes, particularly from the point of view of the railway, also from the general point of view of the district they serve.

FOURTH SECTION

Improvements obtainable in rivers in the portions used by shipping.

TENTH QUESTION. — **Improvements obtainable in rivers in the portions used by shipping, including their estuaries.**

Upper reaches of the river; amount of fresh water flow at dead low-water, at ordinary times, and in times of flood. Nature and amount of the matter carried down by the stream. Lower reaches of the river; chart, tide, winds, currents. Nature and amount of the marine deposits — map of the river; longitudinal section, cross-section. Nature of the sides of the centre channel; bars and shallows; their mouvement. Tides and currents in the river. Amount of tide-water. Works carried out : improvement of the main stream, embankments, dredging. Their resulting effect on the action of the river and on navigation.

NAMES OF THE REPORTERS

AND

TITLES OF THE REPORTS SUBMITTED TO THE Vth CONGRESS

FIRST SECTION

Construction and maintenance of waterways.

FIRST QUESTION. — *Consolidation of canal banks.*

1. **Schlichting.** — Consolidation of canal banks. (Germany) (G.E.F.)

2. **Peslin.** — Consolidation of the canal banks in the North of France. (France) (F.E.G.)

3. **van der Sleyden.** — Consolidation of canal banks in the Netherlands. (Netherlands) (F.E.G.)

4. **de Hoerschelmann.** — On some works of consolidation of canal banks executed in Russia. (Russia) (F.E.G.)

SECOND QUESTION. — *Water consumption in canals.*

5. **Leboucq.** — The water supply of the Belgian canals. (Belgium) (F.E.G.)

6. **Denys.** — On the water supply of canals, especially in the Eastern region of France. (France) (F.E.G.)

N. B. — (1) The name of a country in brackets coming after the title of a report, refers to the nationality of the writer.

(2) The letters E., F. or G., in brackets, refer to the language in which the report was published. (E.) signifies English, (F.) signifies French and (G.) German. The first letter in the bracket indicates the language in which the original report was written.

THIRD QUESTION. — *Leakage in canals.*

7. **Bompiani** and **Luiggi.** — Methods employed in Italy for rendering canals water-tight. (Italy) (F.E.G.)

FOURTH QUESTION. — *Reservoirs.*

8. **Barois.** — Reservoirs in British India. (E.F.G.)

9. **de Llaurado.** — Reservoirs in Spain. (Spain) (F.E.G.)

10. **Bouvier.** — Reservoirs in the South of France. (France) (F.E.G.)

11. **Cadart.** — The reservoirs of the Department of the Haute-Marne. (France) (F.E.G.)

12. **Fontaine.** — Water-supply reservoirs of the Central and Burgundy Canals. (France) (F.E.G.)

13. **de Hoerschelmann.** — The principal reservoirs established in Russia. (Russia) (F.E.G.)

SECOND SECTION

Technical Management.

FIFTH QUESTION. — *Stoppages on canals and canalized rivers.*

14. **Cermelmann.** — Stoppages on canals and canalised rivers in Germany. (Germany) (G.E.F.)

15. **Mailliet.** — Stoppages on canals and canalised rivers in Belgium. (Belgium) (F.E.G.)

16. **Captier.** — Stoppages on canals and canalised rivers in France. (France) (F.E.G.)

17. **Derôme.** — Stoppages on canals and canalised rivers in the Northern and Eastern regions of France. (France) (F.E.G.)

18. **Mazoyer.** — Information on stoppages on navigable ways in the central region of France. (France) (F.E.G.)

SIXTH QUESTION. — *Traction on canals and canalized rivers. Traction on rivers of natural flow.*

19. **Bellingrath** and **Dickhoff.** — Traction on the Elbe and Oder. (Germany) (G.E.F.)

20. **Mütze.** — Traction of boats on canalised rivers and free rivers of the Rhine basin. (Germany) (G.E.F.)

21. **Thiem.** — The traction of boats on the line from Hohensaaten to Spandau. (Germany) (G.E.F.)

22. **Bogart.** — Methods of traction on the Erie canal, with notes on the transportation of coal on the Ohio river. (United States) (E.F.G.)

23. **Caméré.** — Traction on canalised rivers such as the Lower-Seine. (France) (F.E.G.)

24. **Derôme.** — Traction on canals in the regions of the North and East of France. (France) (F.E.G.)

25. **Lasmolles.** — The traction of boats in France. (France) (F.E.G.)

26. **Molinos** and **de Bovet.** — Traction of boats on canalised rivers. Towage by chain or by steam tugs. (France) (F.E.G.)

THIRD SECTION

Commercial working and economic questions.

SEVENTH QUESTION. — *Taxes and tolls on navigable waterways.*

27. **Sympher.** — Tolls and dues on navigable ways in Germany. (Germany) (G.E.F.)

28. **Beaurin-Cressier.** — Dues on inland navigation. (France) (F.E.G.)

29. **Couvreur.** — On tolls and fees collected on navigable ways. (France) (F.E.G.)

30. **Clements.** — Taxes and tolls upon the inland navigation of the United Kingdom. (Great-Britain) (E.F.G.)

31. **Deking-Dura.** — Dues and tolls on navigable ways in the Netherlands. (Netherlands) (F.E.G.)

32. **de Sytenko.** — Taxes and tolls on waterways in Russia. (Russia) (F.E.G.)

EIGHTH QUESTION. — *Conditions of administration of inland ports.*

33. **von Doemming.** — Building and working of the inland ports in the Elbe and Oder basins. (Germany) (G.E.F.)

34. **Imroth** and **Roessler.** — The ports of inland navigation of the basin of the Rhine. (Germany) (G.E.F.)

35. **Delaunay-Belleville.** — On the commercial regime of the inland navigation-ports in France. (France) (F.E.G.)

36. **Monet.** — The regime of ports of inland navigation. (France) (F.E.G.)

NINTH QUESTION. — *Respective roles of waterways and railways in the transport industry.*

37. **van der Borght, Harttung, Landgraf** and **Merkens.** — Respective relations of waterways and railroads in transport trade. (Germany) (G.E.F.)

38. **Pescheck.** — Respective uses of waterways and railroads in the transport industry in the basins of the Elbe and Oder. (Germany) (G.E.F.)

39. **Pollack.** — The Elbe traffic and tariffs. (Austria) (G.E.F.)

40. **Schromm.** — Respective uses of waterways and railways in regard to transportation. (Austria) (G.E.F.)

41. **Ely.** — The Great Lakes of North America. (United States) (E.F.G.)

42. **North.** — Notes on the relations between railroads and waterways in the United-States. (United States) (E.F.G.)

43. **Roberts.** — Respective uses of the waterways and railways in general transportation in the United States. (United States) (E.F.G.)

44. **Fleury.** — Respective uses of waterways and railroads. (France) (F.E.G.)

45. **Halasz.** — The respective uses of the waterways and railways in the transport trade of Hungary. (Hungary) (G.E.F.)

FOURTH SECTION

Improvements obtainable in rivers in the portions used by shipping.

TENTH QUESTION. — *Improvements obtainable in rivers in the portions used by shipping, including their estuaries,*

46. **Franzius.** — Improvements of tidal rivers, including their estuaries. (Germany) (G.E.F.)

47. **Troost** and **Vander Vin.** — Improvement of the mouth of the Scheldt. (Belgium) (F.E.G.)

48. **Corthell.** — Improvement of river mouths. (United States) (E.F.G.)

49. **Guérard.** — Improvement in the mouth of the Rhône. (France) (F.E.G.)

50. **Mengin-Lecreulx** and **Fargue.** — The tidal Seine. Conditions of establishment of a rational outline of artificial banks on a navigable river with shifting bed. (France) (F.E.G.)

51. **Vernon-Harcourt.** — Improvement of the maritime portions of rivers, including their outlets. (Great-Britain) (E.F.G.)

52. **Welcker.** — Improvement of the fluvial way from Rotterdam to the Sea. (Netherlands) (F.E.G.)

53. **Bela de Gonda.** — The arrangements for the passage of vessels through the Iron gates and other cataracts of the Danube. (Hungary) (F.)

54. **de Timonoff.**— The mouths of the Volga. (Russia) (F.E.G.)

COMMUNICATIONS

55. **Pelletreau.** — Views on the projected scheme of a masonry dam at Oued-Athmenia (4th Question). (France) (F.)

56. **Caillot.** — Scheme for the electric haulage of vessels along the subterranean watershed reach of the canal de Bourgogne. — Report of the Committee of enquiry appointed by the Minister of Public Works. (France) (F.)

57. **Captier.** — Monograph on the bargeman (6th Question). (France) (F.)

58. **De Mey.** — The estuary of the Scheldt (10th Question). (Belgium) (F.)

59. **Comstock.** — Note on improvements on the Mississipi. (United States) (F.)

60. **Pasqueau.** — Graphic statistics of the passes of the Gironde and the tidal portion of the Garonne. (France) (F.)

61. **Mendès Guerreiro.** — The Tagus. (Portugal) (F.)

VARIOUS PUBLICATIONS :

62. *Official guide-programme.* Paris 1892. (F.)

63. *Condensed report of the work of the Congress.* Paris. 1892. (F.G.E.)

64. *Report of the proceedings of the meetings of the sections and report on the excursions.* Paris. 1892. (F.)

65. *Catalogue of the Exhibition.* (F.)

66. *Album of photographic views of the buildings of the Congress.*

CONCLUSIONS

ADOPTED BY THE Vth CONGRESS

FIRST SECTION

Construction and maintenance of waterways.

FIRST QUESTION. — **Consolidation of canal banks.**

CONCLUSIONS ADOPTED :

a) The systems of protection of banks adopted on canals of the North of France, near the water-level only, and consisting of small stakes below the water-level and of facings of small extent above, systems admittedly sufficient on canals where only a traffic at low speed takes place, are recommended by the Congress.

b) The Congress expresses the following wish :

1. That experiments be made in different countries to complete and extend the results and consequences of those made on the Erie Canal, in view of establishing the relations that exist between the speed, effort of traction and immersed section of boats on the one hand, and on the other hand the surface and form of the water section of canals, both maritime and inland.

2. That these same experiments be made in view of establishing the influence which the degree of inclination of the banks has on the action of the wave produced by the propulsion of boats at increasing speeds.

3. That a critical examination of these experiments should form the subject of one of the questions to be treated at the next Congress.

SECOND QUESTION. — **Water consumption in canals.**

CONCLUSIONS ADOPTED :

The Congress expresses the opinion that the important question of water-supply for canals demands incessant investiga-

tions; and that, whilst the interesting communications which have been submitted to it deserve the attention of engineers, they cannot be too urgently requested to publish the results of their personal experience, to the advantage of the general and international interest.

It notices that the first portion of the particular question submitted leaves much to be done by fresh investigations, and concludes that there is reason to recommend future Congresses to give, in their programme, to the matter in question, the share of importance that belongs to it.

THIRD QUESTION. — **Leakage in canals.**

CONCLUSIONS ADOPTED :

The Congress is of opinion that the study of the various systems of making the bed of canals water-tight, in connection with that of the water-supply, claims the continuous attention of engineers and Congresses of navigation. The Congress deems it its duty specially to recommend, as regards the saving in outlay which may be realised, the consideration of the thickness to be given to the masonry, and the special arrangements of works.

FOURTH QUESTION. — **Reservoirs.**

CONCLUSIONS ADOPTED :

1. As regards dams of earth :

A. Although there are few instances in France of dams of a height exceeding 50 feet, it seems possible to build them higher: the solution of the question depends essentially on the quantity and quality of the materials at hand, on a comparison between the cost price of a dam of earth, and of masonry, and the nature of the subsoil.

B. The mechanical puddling of earths, by steam, or at any rate by animal traction, should be recommended as giving excellent results, and ramming by hand should be given up as

far as possible, as very costly and as producing an incomplete and altogether unhomogeneous embankment.

C. It is adviseable not to execute the facings in masonry of the upstream slope of the dam at the same time as the puddling.

D. The solution adopted at the Edinburgh Water-Works and at Torcy-Neuf, consisting in establishing the outlet-sluices in an isolated tower, placed outside, and on the up-stream side of the dam, and sunk as much as possible in the solid ground, the supply conduit issuing at the foot of the said tower and passing under the dam, facilitates in a remarkable manner the execution of homogeneous puddle and should be recommended.

E. The rapid method, pointed out by Mr. Cadart, for estimating approximately the cost of a reservoir with an earthen dam, appears likely to render service in the study of a preliminary project, when the estimates are not required to be made with any great precision.

II. As regards dams of masonry:

F. The profile of the dam of Chartrain, or any other similar profile, and combined in such a manner as to suppress as much as possible the expansive thrust on the upper crest, should be recommended.

G. With good materials, the masonry may be made to bear, without risk, as high a compressive strain as 170 lbs. per square inch.

H. The form on plan of a curve with its convexity up-stream appears worthy of recommendation for masonry dams, especially on account of the effects of expansion and contraction due to the variations of temperature on the upper portion of dams.

I. It is well to call the attention of engineers to the measures to be taken to avoid leakages through the masonry, and to reduce their effects in course of working.

SECOND SECTION

Technical Management.

FIFTH QUESTION. — **Stoppages on canals and canalized rivers.**

CONCLUSIONS ADOPTED :

1. The Congress expresses a wish that this important question should be brought forward at the next Congress.

2. The Congress expresses a wish that information should be collected for the next Congress on the technical and pecuniary conditions of the execution of works during winter stoppages, especially as regards masonry works.

3. It is necessary, even at great cost, to reduce to a minimum the duration of stoppages. Apart from the interruptions of traffic brought about by frost, it is adviseable, save in exceptional cases, to do away completely with stoppages on open or canalized watercourses, and to reduce their duration at least to:

10 days per annum on canals in a state of maintenance;

30 days per annum on canals in course of transformation.

SIXTH QUESTION. — **Traction on canals. — Traction on canalized rivers. — Traction on rivers of natural flow.**

CONCLUSIONS ADOPTED :

It would be desirable to investigate experimentally the distribution of the efforts of traction on the different reaches of canalised rivers, by adopting the method applied in the experiments actually being carried out along the Lower Seine by Messrs. Caméré and Clerc, an account of which was given by M. Caméré in his report.

Considering that rope haulage would constitute a practical solution of traction on canals with large traffic, if freed from the effects of the twisting of the cable which still sometimes prevails in spite of the precautions taken to prevent it, the Congress expresses a wish that the experiments made at St-Maur on the one hand, and those made on the canal from the Oder

to tne Spree on the other, should be continued with the special object of studying the causes of the twisting, and above all of completing the remedy against the efforts of traction which it may exert on the tow-ropes of boats.

The Congress expresses a wish that, over and above the experiments on rope haulage, experiments should also be made on the use of the system of electrical towage invented and exhibited by Mr. de Bovet.

It is desirable that every boat should, as soon as possible, be provided with an official return showing, for the different relative velocities, its resistance to traction.

The Congress appreciating the wide scope of the experiments undertaken by Mr. de Mas, expresses a wish that these experiments should be prosecuted in all the details they comprise, especially in what concerns the influence of the state of the surface on the resistance to traction.

The Congress expresses a wish that the question of the most economical organisation of traction on navigable ways be submitted to the next Congress.

THIRD SECTION

Commercial working and economic questions.

SEVENTH QUESTION. — **Taxes and tolls on navigable waterways.**

CONCLUSIONS ADOPTED :

The Congress adopts anew the proposal voted at Manchester, concerning the role of the State in the construction and maintenance of waterways (1). The great value of navigable ways for the country taken as a whole, and the fact that they feed the railways of which they are an indispensable adjunct, justify the intervention of the State and the public authorities to help, as far as possible, the construction and maintenance of navi-

(1) See IVth Congress, 4th question. « Present position, management, and working costs of canals. » Conclusions. 4°.

gable ways of uniform dimensions, so as to encourage transports for long distances and at reduced prices."

The traffic on navigable ways should, as far as possible, be subjected to no impost;

Special tolls may be authorised to pay or guarantee, in the absence of public resources, all expenses of a nature to favour the development of navigable ways and barge-traffic.

EIGTH QUESTION. — **Conditions of administration of inland ports.**

CONCLUSIONS ADOPTED :

1. Wherever operations of loading and unloading take place, either along the waterway or at specially arranged ports, it is adviseable to design the banks so that they shall facilitate these operations being carried out as speedily as possible.

Where the nature of the waterway demands the construction of docks for the protection of the barge industry from the dangers of floods and ice, it is adviseable that these docks should be laid out as commercial docks.

2. In order to develop inland navigation, and insure its full economic return, it is useful to equip the ports with loading and unloading plant, long platforms, warehouses, sheds, etc., suitable to modern requirements.

Shipping can bear taxation, drawn up on the cost of maintenance and the interest on the capital, and which will be used for constructions of this kind, far more easily than the damage which it may suffer owing to insufficiency of appliances and equipment in ports.

3. The use of public ports must be governed by regulations, only containing measures necessary for safety and order, without restricting the liberty of circulation for the benefit of some special person or other, except in cases where private individuals have supplied the whole amount or the major portion of the funds required for the fitting up and maintenance of the port.

4. It is important to facilitate the exchange of marchandise between railways and navigable ways; and the appliances for

effecting this exchange ought to be considered as a necessary part of the mechanical plant of ports and wintering harbours. It is the business or office of governments to use, if necessary, their authority or their legitimate influence with the administrations of railway companies to ensure the construction and the commercial working of these junctions to public ports, without any increase of charge other than that resulting from the mileage, and to private ports, under the conditions of common right concerning private branches.

NINTH QUESTION. — **Respective roles of waterways and railways in the transport industry.**

CONCLUSIONS ADOPTED :

The Vth International Congress of Inland Navigation can only repeat and confirm, in accordance with the reports which have been laid before it, the declaration adopted by the fourth Congress held at Manchester in 1890, and previously formulated in principle at the second Congress held at Vienna in 1886, and which is in the following terms : (1)

"The existence and simultaneous development of railways and waterways is desirable :

1. Because these two means of transport are the complement of each other, and ought to contribute, each according to its special merits, to the public good;

2. Because from a broad point of view, the industrial and commercial development which results from the perfecting of the means of communication must in the end profit both railways and waterways."

The respective spheres of waterways and railways in any given country depend above all upon the natural conditions existing for navigation, as well upon the character of the economic policy which governs the transport of goods.

---

(1) See IVth Congress. 4th question. « Present position, management and working costs of canals. » Conclusions. 3°.

FOURTH SECTION

Improvements obtainable in rivers in the portions used by shipping.

TENTH QUESTION. — **Improvements obtainable in rivers in the portions used by shipping, including their estuaries.**

TIDELESS RIVERS.

1. If, after surveys, or better still after preliminary trials it were admitted that dredging should not be used, the only method of deepening the outlet of sediment-bearing rivers, flowing into tideless seas, is to prolong one of their delta channels by parallel jetties out beyond the bar, so that the prolonged current, being concentrated when crossing the bar, may scour a deeper channel, and carry its burden of sediment into deep water further out.

2. One of the minor outlets should be selected, if its delta channel is adequate, or can easily be made adequate for the requirements of navigation; and the discharge of the other outlets should not be interfered with. The advance of the delta at one of the minor outlets is slower, and the distance out to the bar is less, and consequently the jetty works are less costly; whilst an increased discharge, produced by impeding the flow through the other outlets, would also increase the volume of sediment, and therefore quicken the rate of advance of the delta, and hasten the necessity of prolonging the jetties.

3. The success of the jetty system depends on a rapid deepening of the sea in front of the river mouth; on the fineness and lightness of the sediment brought down; and on the existence of a coastwise current, its velocity, and the depth to which it extends. Any erosive action of winds and waves along the shores of the delta is favourable to the system, and also any reduction in density of the sea-water, such as may be found in an inland sea.

4. If the sea bottom is flat; if a large proportion of the sediment is so dense that it is carried along the bed of the river, or close to it; if the outlet faces the prevalent winds; and if no

coast wise current exists, it is possible that an improvement of the outlet may not be practicable; and then recourse must be had to a side canal, starting off from the river some distance up, and entering the sea beyond the influence of the alluvium of the river.

5. The jetty system does not constitute a permanent improvement; sooner or later, in proportion as the physical conditions are unfavourable, or the reverse, a bar is formed further out, and a prolongation of the jetties becomes necessary.

Tidal rivers

1. The different meanings which have been given by the several authors, to the word estuary have caused confusion. It has not appeared expedient or possible to exactly define the sense of this word; but engineers who treat of the questions relating to river mouths, are earnestly requested to indicate precisely what they understand or mean by estuaries in the special case which they have under consideration.

2. The size and depth of a tidal river being mainly due to the tidal flow, any works which increase its volume and extend its influence, such as the removal of obstructions, dredging hard shoals, and the lowering of the low-water level by deepening the channel, effect an improvement in the navigabilty of the river; whilst any works which restrict the tidal influx, even though producing a local deepening by scour, are liable, unless under exceptional conditions, to injure the general navigable capabilities of a tidal river.

3. The regulation of the banks of tidal rivers, so as to remove abrupt variations in width, equalises the tidal flow, reduces accretion, and facilitates the tidal influx, and therefore constitutes an important means of improvement, even if accompanied by a slight reduction of tidal capacity at certain parts by the obliteration of indents, which are in general more than compensated for by the improved scour, and consequent lowering of the low-water line, especially if accompanied by the removal of shoals.

4. The extent of the filling basin necessary for the maintenance of rivers and of their estuaries depends more on the

methodical and rational laying out of the sections and widths, than on the lateral reservoirs which sometimes present grave inconveniencies, and which ought only to be constructed in special cases.

5. Dredging furnishes a most valuable method of deepening a tidal river, which may be carried far beyond the limits of natural scour if the trade of a river port justifies a large expenditure; and a small river may be thus converted into a waterway accessible by large vessels at all states of the tide, of which the Tyne forms a notable instance. Furthermore by means of dredging the facilitating of the transmission of the tides, and the increase in the flood and ebb is effected, resulting in the improvement of the mouth of the river.

In fact by means of the improvements which dredging has received in recent years, the scope for this kind of improvement has become greatly enlarged.

6. It is necessary to call the attention of engineers to the advantages which can be gained in the matter of tidal, as well as non-tidal rivers, in generalising the study which has been made on the Garonne, concerning the correlation between the curves of the bed and the depth of the channel. The results of these investigations, when the next Congress takes place, should be brought nearer to each other, in view of the rules to be adopted in the choice of the lines and the construction, if necessary, of a low-water channel, as much for tideless rivers as for tidal rivers.

7. According to experiments which have been made principally by Mr. Vernon-Harcourt, it would appear to be useful, previous to making a scheme for the training of a wide estuary with movable bed, and where the alluvium is brought in by the tide, to study by means of a small scale model, with as much precision as possible, the results produced in the model by training walls of different forms, not in order to determine exactly the nature of the channel and the definite depths which would be obtained, but to compare the different projects with each other as regards the position of the channel its size, and the distribution of the banks or accretions.

INTERNATIONAL CONGRESS

OF

INLAND NAVIGATION

VIth Congress

The Hague 1894

PROGRAMME OF THE PROCEEDINGS OF THE CONGRESS

FIRST SECTION

Construction and maintenance of canals and ports.

First Question. — **Construction of navigation canals affording operation at high speed.**

Forms and dimensions of the canal section which will permit a boat of a given immersed section to attain a desired speed with the least tractional effort. Necessary excess depth of the canal over draught of boats. Minimum radius to be adopted for canal curves. The most efficacious disposition and most economical construction for the protection of slopes and bermes.

Second Question. — **Plant of ports of navigation.**

Different systems of plant for ports. Advantages and disadvantages of these systems. Operating conditions. Economic results. Better arrangement of the connections between the railroads and the ports.

SECOND SECTION

Technical Treatment.

THIRD QUESTION. — **Means for preventing ice blockades.**

Different systems and methods of breaking and removing ice. Ice-breaking boats, explosive materials, etc. Results obtained. Price of construction of necessary apparatus. Expenses of operation.

FOURTH QUESTION. — **Traction and propulsion upon canals, canalized rivers, and rivers of natural flow.**

Progress made since the preceding congress in the application of various systems of boat traction and propulsion. New systems invented or applied since then. Influence of the shape of boats and the condition of their surface on traction resistance. Speed necessary and attainable for cargo boats as for steamers and tugs with their tows.

THIRD SECTION

Commercial treatment and economic questions.

FIFTH QUESTION. — **Tolls on navigable ways.**

Rates of tolls; influence of mileage; of the tonnage of boats; of the nature, value and quantity of goods transported. Classification of freights. Exemption from, or moderation of, tolls on boats returning empty. Method of collection. Control. Additional tolls for movement of locks, dams and bridges. Special extra charge for night service.

FOURTH SECTION

Navigable rivers and their improvement.

SIXTH QUESTION. — **Relations between the configuration of rivers and the depths of their channels.**

Comparative study of the forms and depths of the principal watercourses, tidal and non-tidal, and with variable bottoms, with respect to the following points : Correlation between curvature and depth; distance between points of greatest and least curvature and corresponding points of greatest and least depth (law of deflection). Applica-

tion of the experimental graphic method based upon synoptic diagrams of curves and depths. Influence of width and discharge of rivers on the least depth, in cases where curves are nearly equal. Influence of a form consisting of straight lines and arcs of circles compared with that constructed upon Mr. Fargue's system. Influence of high and low water on the channel depth in curve. Maximum sinuosity compatible with a continuous channel for different discharges and widths. Practical rules to be adopted for the choice of form and constitution of a low-water channel for non-tidal and tidal rivers.

SEVENTH QUESTION. — **Regulation of rivers at low-water.**

Influence exerted upon the current of a river by continuous longitudinal dykes constructed so that at low water they enclose the entire river and remain slightly submerged. Possibility of regulating rivers by means of works designed to employ the total discharge in favour of navigation at low-water.

NAMES OF THE REPORTERS

AND

TITLES OF THE REPORTS SUBMITTED TO THE VIth CONGRESS

FIRST SECTION

Construction and maintenance of canals and ports.

FIRST QUESTION. — *Construction of navigation canals affording operation at high speed.*

1. **Cröhe.** — Construction of ship canals affording operation at high speed. (Germany) (G.E.F.)

2. **Derôme.** — Construction of navigation canals affording operation at high speed. (France) (F.E.G.)

3. **Wortman,** H. — Construction of navigation canals affording operation at high speed. (Netherlands) (F.E.G.)

SECOND QUESTION. — *Plant of ports of navigation.*

4. **Monet** and **Dardenne.** — The plant of French inland navigation ports. (France) (F.E.G.)

5. **De Jongh,** G.-J. — The Port of Rotterdam. (Netherlands) (F.E.G.)

6. **Schuurman,** J.-A. — The Port of Amsterdam. (Netherlands) (F.E.G.)

N. B. — (1) The name of a country in brackets coming after the title of a report, refers to the nationality of the writer.

(2) The letters E., F. or G., in brackets, refer to the language in which the report was published. (E.) signifies English, (F.) signifies French and (G.) German. The first letter in the bracket indicates the language in which the original report was written.

SECOND SECTION

Technical Treatment.

THIRD QUESTION. — *Means for preventing ice blockades.*

7. **Narten,** G. — Means for preventing ice blockades. (Germany) (G.E.F.)

8. **Caméré** and **Rigaux,** P. — Means for preventing ice blockades. (France) (F.E.G.)

9. **Dibos,** M. — The clearing away of the ice in the estuaries tidal and nontidal rivers. (France) (F.E.G.)

10. **Bekaar,** A.-A. and **Nelemans,** J. — Means for preventing ice blockades. (Netherlands) (F.E.G.)

11. **Schuurman,** C.-B. and **Burgdorffer,** A.-C. — Efforts to clear away the ice on some of the Dutch rivers. (Netherlands) (F.E.G.)

12. **Cramer,** C.-F. — Means for preventing ice blockade. (Netherlands) (F.E.G.)

FOURTH QUESTION. — *Traction and propulsion upon canals, canalized rivers, and rivers of natural flow.*

13. **Hirsch,** J. and **de Mas,** B. — Traction and propulsion on canals, canalized rivers, and free current rivers. (France) (F.E.G.)

14. **de Bovet,** A. — The method to organize different systems of traction on rivers, canals, etc. (France) (F.E.G.)

15. **Stieltjes,** E.-H. — Traction and propulsion upon canals, canalized rivers, and rivers of natural flow. (Netherlands) (F.E.G.)

THIRD SECTION

Commercial treatment and economic questions.

FIFTH QUESTION. — *Tolls on navigable ways.*

16. **Hatschek.** — Tolls on navigable ways. (Germany) (G.E.F.)

17. **Dufourny,** A. — Tolls and taxes on navigable ways in Belgium. (Belgium) (F.E.G.)

18. **Renaud,** M. — Tolls on navigable ways in France. (France) (F.E.G.)

19. **Déking Dura,** A. — Tolls on navigable ways. (Netherlands) (F.E.G.)

FOURTH SECTION

Navigable rivers and their improvement.

SIXTH QUESTION. — *Relations between the configuration of rivers and the depths of their channels.*

20. **Jasmund,** R. — Connection between the depths of streams and river beds. (Germany) (G.E.F.)

21. **Mengin-Lecreulx** and **Guiard.** — Relation between the form of river banks and the nature of the channel. (France) (F.E.G.)

22. **Castendijk,** R.-J. — Relations between the form of river banks and the depth of the channel or thalweg. (Netherlands) (F.E.G.)

23. **Doyer,** H. — Geldersche Yssel. (Netherlands) (F.E.G.)

24. **Ermerins,** J.-G. — The Pannerden Canal, Lower Rhine, and Leck. (Netherlands) (F.E.G.)

25. **Tutein Nolthenius,** R. — Remarks upon the depth of the Upper Meuse between Mook and Hedel. (Netherlands) (F.E.G.)

26. **Schuurman**, C.-B., and **Van Hooff**, H.-L.— Relations between the confirmation of rivers and the depths of their channels. (Netherlands) (F.E.G.)

27. **Steyn Parvé,** D.-J. — The New Meuse and the waterway from Rotterdam to the sea. (Netherlands) (F.E.G.)

28. **Léliavski,** N. — River currents and the configuration of river beds. (Russia) (F.E.G.)

29. **Maksimoviecz,** N. — Observations on the formation of the bottom of a river whose course is regulated by means of dams and dikes. (Russia) (F.E.G.)

SEVENTH QUESTION. — *Regulation of rivers at low water.*

30. **Seidel.** —The regulation of rivers at low water. (Germany) (G.E.F.)

31. **Cirardon,** H. — Regulation of rivers at low water. (France) (F.E.G.)

32. **van der Sleyden,** Ph., and **Castendijk,** R.-J. — Regulation of rivers at low-water. (Netherlands) (F.E.G.)

33. **de Timonoff,** V.-E. — The rapids on the Dnieper. (Russia) (F.E.G.)

B. — COMMUNICATIONS.

34. **Mendès Cuerreiro,** J.-V. — Influence of the shape of vessels and the condition of their sides on their resistance to traction. (Portugal) (F.)

35. **de Hoerschelmann,** E.-F. — Historical sketch of the development of waterways in the Russian Empire. (Russia) (F.)

36. **Schultz.** — Consumption of water by canals, resources and works carried out on the Canal from the Oder to the Spree with a view to rendering it watertight. (Germany) (G.)

37. **Schultz.** — On the carrying out of maintenance works on waterways, more especially : masonry and carpentering work carried out in winter. (Germany) (G.)

38. **Triest,** W.-G. — The navigable way from Rotterdam to the sea. (United States) (E.)

VARIOUS PUBLICATIONS

39. *Guide* in two volumes: *a. Programme, maps, drawings; b. Various communications.* The Hague. 1894.

40. *Account of the proceedings of the Congress.* The Hague. 1894 (F.)

41. *Report of the French delegates on the proceedings of the Congress.* Paris. 1895. (F.)

CONCLUSIONS

ADOPTED BY THE VIth CONGRESS

FIRST SECTION

Construction and maintenance of canals and ports.

FIRST QUESTION. — **Construction of navigation canals affording operation at high speed.**

CONCLUSIONS ADOPTED :

The Congress is of the opinion :

1° — That it is adviseable to renew the suggestions adopted by the Congress of Paris in relation to continuing the studies of the consumption of water in canals and of the processes for making the bottom water tight.

2°. — That the experiments begun by Chief Engineer de Mas, to determine the relations which exist between the speed, the effort of traction, and the shape of the immersed section of the boats on the one side, and the surface and shape of the wetted section of canals on the other, should be actively continued in the various countries, in order that the Committee on Organization of the next Congress may be able to propose the following question to advantage :

"To determine the average cross-section of a canal which will enable a boat of given form and cross-section to attain a desired speed with a given effort of traction."

3°. — That the experiments in question should bear particularly on the increased resistance developed by boats passing in opposite directions, both on tangents and on curves.

4°. — That observations should be made with a view to determining to what depth below the surface of the water the effect of currents and of waves is felt, when a canal having a given wetted section is traversed at a given speed by a boat having a given immersed section.

5°. — That the maximum velocities to be laid down for steamers, as a police measure, should be proportioned to the relations which exist between the immersed section of the these vessels and the wetted section of the canal, and that it is necessary that the consolidation works for the banks be so carried out that they will resist the action of the waves raised by the passage of steamers moving at a rate of speed indispensable for safe steering.

SECOND QUESTION. — **Plant of ports of navigation.**

CONCLUSIONS ADOPTED : (1)

The Congress considers it proper to complete the resolutions adopted by the Vth Congress under the item 2°, which should be modified as follows :

"In order to develop inland navigation and to secure for it its " full economic efficiency, there is needed an extensive and " perfected mechanical outfit, large tracts of ground, as well as " storehouses and sheds equipped with a plant suited to modern " requirements.

" It will be much easier for navigation to bear the charges " for the use of such plants, calculated in accordance with the " cost of maintenance and the interest on the capital invested, " than to put up with the loss which it would encounter through " the insufficiency of the equipment of the ports."

It is well understood that the development to be given to the equipment of each port should be subordinated to the importance and the real needs of the port.

For important ports which are intended to receive a complete equipment (railways, sheds, storehouses, warehouses, machines for handling freight), this equipment should be designed in accordance with a general programme, which insures a perfect cohesion among the various elements which enter into the installation.

---

(1) The conclusions adopted by the Vth Congress are shown in inverted commas.

The equipment for the navigable highway itself, includes the provision of special machines for loading and unloading freight, and packages of exceptional size or weight, wherever such machines may be useful.

" The use of public ports ought to be regulated by rules which " only contain measures necessary to be taken for ensuring " safety and order, without restraint on the liberty of circula- " tion for the benefit of certain private individuals, excepting " in cases where private individuals supply all or a large part of " the necessary funds for the installation and maintenance of " these ports."

Private outfits may be authorized at public ports, provided that their erection be not contrary to the general interest.

In order to insure the development of the equipment at public ports, it is well to favor and to encourage private initiative as much as possible.

It is important to avoid, at all ports of small importance, any equipment and expense which is not fully justified. Private initiative seems to be peculiarly fitted to give satisfactory economic results under these conditions. Still it is well to assist it, especially by simplifying, so far as possible, the formalities required for the installation and operation of the machinery.

For the equipment of important ports, as well as for the erection of special machines for handling exceptionally heavy freight, the public authorities may, when private initiative is lacking, step in either directly or by the intermediary of individuals acting by delegation. The grants relating to these equipments should emanate from the central power.

Every grant towards a public outfit involves fixing a minimum rate at which outfit will be placed at the disposal of the public, without preference or favor.

Furthermore, it is important that the conditional and revocable character of the permits, by virtue of which the said equipments can be set up, should be distinctly stated.

SECOND SECTION

Technical Treatment.

THIRD QUESTION. — **Means for preventing ice blockades.**

CONCLUSIONS ADOPTED :

It is desirable that there should be freedom of navigation during frosty weather.

But the methods by which this is to be effected vary according to the districts and waterways where it is to be carried out.

The operation includes, in point of fact, two distinct phases, the breaking-up of the ice and the removal of the broken ice.

From this point of view, it is necessary to differentiate between; (1) Estuaries and tidal rivers; (2) Rivers in their portions unnavigable to shipping, (3) Artificial canals.

In the portions where the action of the tide is felt, the removal of the broken ice, usually, can be carried out without difficulty.

Moreover, the considerable importance of keeping the approaches to harbours free and open, justifies considerable expenditure. In such a case, it is best, if possible, to open a channel, which should be kept open by the frequent passage of ice-breakers or steam boats. Apart from the tidal portion of a river, the removal of ice in rivers with a natural flow, may also be carried out, but in the face of difficulties which are sometimes exceedingly great. The requirements moreover rarely demand the keeping open of a permanent channel. In such cases it is possible to hasten the re-opening of the river to navigation on the approach of thaw, by the use of ice-breakers or other mechanical means, or by the use of explosives.

In any case, it is necessary to take precautions to prevent the accumulations of drift ice, which might form in the lower reaches.

---

(1) The VIth Congress, at The Hague, asked that a distinction be made hereafter between the *maritime sections* of rivers and the *sections which have an exclusively fluvial condition of flow.*

When accumulations of drift-ice are formed, use should be made of ramming vessels, such as have been succesfully used on the Elbe and the Vistula, or of explosives, as has been done number of rivers in various countries.

On ship-canals, the removal of ice is impossible. Nevertheless, the commercial interests being similar to those in the case of tidal rivers, it is important to try to maintain, by similar means, an open channel always open to the use of the barge industry.

On inland canals and canalized rivers, which are alike, similar means are rarely possible. If it should be possible to break a channel through the ice, the vessels in use on the canals, being less strongly built than those in use on main rivers and estuaries are still unable to force their way through the floating blocks of ice. But it is adviseable to reduce the period of stoppage as much as possible, by operating with ice-breakers, as long as possible before the complete freezing over of the canal, and directly the thaw shows sighs of beginning. As to the use of explosives they are not adviseable for use on canals.

As regards the passage through rivers canalized by means of moveable weirs, the breaking up of the ice is unnecessary from the point of view of navigation, which can only take place so long as the weirs are open, and so long as the final complete freezing up has not taken place.

The Congress suggests that the experiments should be continued, so as to determine the best methods to be employed in each case.

FOURTH QUESTION. — **Traction and propulsion upon canals, canalized rivers, and rivers of natural flow.**

CONCLUSIONS ADOPTED :

1st Resolution. — The Congress of Paris, after a thorough discussion recommended certain studies which are of great interest to inland navigation, namely :

The continuation of experimental researches on the resistance of boats to traction, in accordance with the methods employed by Messrs. Caméré, Clerc and de Mas;

Study of the twist, in towing by cable;

Experiments in electric towing;

Studies of the economical organization of traction.

The VIth Congress has noted with satisfaction that, since the Congress of Paris, most of these questions have advanced greatly, that they have become well defined and matured, that partial solutions even have been found. All the same, the Congress considers that it is well to continue experiments in the same direction. It has, therefore, the honor to propose that the same questions be kept on the programme for the next Congress of Navigation. Furthermore, in order to take into account the facts which have been acquired, the Congress thinks it permissible to dwell especially on the researches to be carried on with a view to establishing electrical towing on canals.

2d Resolution. — According to the experiments of Mr. de Mas, so liberally encouraged by the French Government, it seems possible to build, for inland navigation, boats which, while remaining of nearly equal tonnage to the types now in use, would offer much less resistance to traction both in canals and on rivers. The results would be, according to cases: a corresponding reduction in the effort and, hence, in the cost of traction; or an increase in speed and, therefore, a reduction in the length of the trip.

3d Resolution. — The Congress, being of opinion that the conversion of the service of traction on certain navigable highways into a monopoly may, in certain cases, answer to a general interest, proposes to submit this question to the deliberations of the next Congress.

THIRD SECTION

Commercial working and economic questions.

FIFTH QUESTION. — **Tolls on navigable ways.**

CONCLUSIONS ADOPTED :

The Congress has considered itself bound to keep to the programme laid down.

It has not returned to the discussion of the free transit or otherwise of traffic on waterways, which was gone into fully at the Paris Congress; it has kept this question to the exact lines laid down, and has confined itself to existing cases in various countries; how, in each case, the question of tolls has been decided, and what were the determining factors which led to the decision come to. It has therefore been enabled to determine that in those countries where tolls exist, their amount, their basis and their method of collection depend on extremely variable and complex causes, among which, it is necessary to take into account, as regards each country, its economic state, both from a financial and commercial point of view, also the area of its system of means of communication and their working methods, and in the case of a given country, the nature of the waterway, whether it is a river or a canal, its length, its system of administration, and the competition it has to deal with; it is therefore impossible to draw up, from the examination held by the Congress, definite rules, as regard must be given to financial matters and to a number of similar issues.

The Congress however considered that the following suggestions might be made:

1. That the units employed as a base for fixing the amount of the tolls in such countries as keep to the toll system, should henceforward always be the ton of goods, weighing 1000 kilogrammes, and the kilometre.

2. That the fees for the working of locks, bridges and barriers, both by night and day, be gradually done away with wherever possible.

3. That the system of collection of the tolls should be made as simple, easy and practical as possible, and should admit of an easy, rapid method of supervision, which would not hinder navigation.

4. That the charges on navigation, on State-built artificial waterways, if such charges are necessary, should not amount to such a sum as to completely reimburse the Treasury for its expenditure, including interest and sinking fund, for each artificial waterway gives rise to other direct or indirect profits to the State, and is of advantage to the community.

The Congress also adopted the following suggestion:

Considering the adviseability of *economic questions relating to inland navigation* having a more important position in future Congresses, the Third section proposes that the next Congress, the VIIth, should increase its programme of economic questions and should specially place on the agenda of its proceedings *the question of the mortgage of canal-barges* and *the unification of methods of gauging the tonnage of inland barges.* (1)

FOURTH SECTION

Navigable rivers and their improvement.

SIXTH QUESTION. — **Relations between the configuration of rivers and the depths of their channels.**

SEVENTH QUESTION. — **Regulation of rivers at low-water.**

CONCLUSIONS ADOPTED :

The Congress adopts, for the 6th and 7th questions, the following resolutions:

1°. — The Congress resolves that there shall be drawn up at the next Congresses a clear, short, but at the same time, sufficiently complete formularly, which shall include the necessary information for defining the characteristics of every river studied from the double point of view of its administration and of the needs of its navigation.

2°. — The Congress resolves that the study of all questions relating to the regulation of rivers be reserved to a single

---

(1) It is of interest to point out that, at the IIIrd Congress, Mr. Wallandt. Councillor of the Hungarian Ministry of Public Works and Ways of Communication, at Buda-Pesth, in his report (n° 3) had formulated, among others, in his report, the following conclusion: That States which are connected by natural or artificial waterways should agree to fix on a common system of estimating the tonnage of barges.

section, but that the questions be classified in the articles as well as in the discussions by taking, as a guide, the nature of the problems to be solved, and that, hereafter, a distinction be made between the maritime sections of rivers and the sections which have an exclusively fluvial condition of flow.

FUSION

OF THE

CONGRESS OF INLAND NAVIGATION

AND THE

MARITIME CONGRESS

The Congress finally decides upon the fusion (1) *of the Congress of inland navigation with the maritime Congress*, with the predominance of river or maritime questions, alternating, so far as possible, according to the country or city where the Congress is to be held. *It also modifies the name of the Congress which will be known in future as the Navigation Congress.*

It also thinks it adviseable, *in order to establish a permanent connection, to continue the powers of the Office of the Congress until the formation of the Committee on Organization of the next Congress*, and to give it the right to take in correspondents in different countries.

The Congress declares that the time has not yet come for changing the period of two years which now intervenes between one Congress and the next.

---

(1) It is owing to the close connection between the studies and work of the Maritime Congress and those of the Congress of Inland Navigation, and owing to the difficulty of drawing a clear dividing line between what pertains to marine and what to inland navigation, as is shown by the programmes of the proceedings of the first six Congresses of Inland Navigation, that the Congress of the Hague decided upon the amalgamation of the two Congresses.

INTERNATIONAL

NAVIGATION CONGRESS

VIIth Congress

Brussels 1898

PROGRAMME OF THE PROCEEDINGS OF THE CONGRESS

FIRST SECTION

Canalized Rivers.

First Question. — **Raising of existing weirs**

Means to be employed for executing the work in order to hinder navigation as little as possible and to curtail the cost of transforming the retaining apparatus.

Second Question. — **Consolidation of weir foundations.**

Work intended to prevent the water from passing underneath the foundations, so as to reduce the expense of maintenance of works; means of execution to be employed in order to hinder navigation as little as possible.

Third Question. — **Utilization of the fall of water at weirs as a motive power.**

Means of utilizing such power at ordinary times for the traction of boats and for work to be performed in the interest of navigation. Utilizing the swiftness of the stream during the high waters.

Fourth Question. — **Resistance to the movement of boats.**

Influence of the shape of boats and the condition of their surface on the tractional resistance.

SECOND SECTION

Inland navigation canals.

FIRST QUESTION. — **Modes of mechanical traction along canals.**

Improvements realised or proposed since the Congress held at The Hague.

SECOND QUESTION. — **Single lock-gates.**

Lifting, rolling, pivoting or turning down gates.

THIRD QUESTION. — **Means of securing the water-tightness of the bed and banks of a canal.**

Lay down precisely and completely the means suggested at the Paris Congress of 1892 in answer to the third question submitted to that congress, viz « Water-tightness of canals. »

FOURTH QUESTION. — **Mechanical lifting from reach to reach of water supplying a canal.**

Means of transmitting directly or at a distance the power required for lifting the water from reach to reach. Steam engines electricity, water pressure, etc.

THIRD SECTION

Tidal rivers and ship canals.

FIRST QUESTION. — **Formulary of characteristic particulars about a tidal river.**

A. *Enumerate in detail the particulars to be collected in order to characterize a river and to be able to compare the regime and conditions of navigableness thereof with those of another river.*

Explain the meaning and value of the terms used, so as to secure bases of comparison applicable to the various rivers.

B. *Furnish in respect of one or more rivers the enumeration of the particulars referred to above.*

SECOND QUESTION. — **Modes of cubature of tidal volumes.**

Submit and compare the analyses of graphical methods capable of determining, for any given section of a river, the tidal volumes at any moment.

THIRD QUESTION. — **Means of consolidation of ship-canal banks.**

Complete the information furnished at preceding Congresses and relate experiments effected, dwelling upon the nature of the soil and conditions of navigation (speed, extent of trafic, mode of propelling, relation between the sections of the canal and boat below the water-level ,etc.)

Outlay for first establishment and expense of keeping in repair.

FOURTH QUESTION. — **Dredging.**

Latest high-power dredgers contrivances, in what cases used, produces, unitary prices.

FOURTH SECTION

Seaports.

FIRST QUESTION. — **Warehouses and sheds.**

Accomodation, size, mode of construction, means of access.

SECOND QUESTION. — **Relative surfaces of the different parts of a seaport.**

Docks, quays, railways, warehouses and sheds, ground reserved for commerce and industry.

THIRD QUESTION. — **Free ports.**

Reasons therefor and conditions of establishment, installations, dimensions.

FOURTH QUESTION. — **Single lock-gates.**

Contrivances recently devised.

FIFTH SECTION

Tolls, dues and local charges.

First Question. — **Maritime tolls, dues and local charges. Mode of collection.**

Collection per ton capacity or per ton weight. Nature and amount of local charges.

Second Question. — **Unification of the measurement system of boats for inland navigation.**

Position of the matter.

NAMES OF THE REPORTERS

AND

TITLES OF THE REPORTS SUBMITTED TO THE VIIth CONGRESS

FIRST SECTION

Canalized Rivers.

A. — QUESTIONS.

First Question. — *Raising of existing weirs.*

1. **Roloff,** E. — Raising of existing weirs. (Germany) (G.F.)

2. **Fendius,** E. — Raising of existing weirs. (Belgium) (F.)

3 **Pavie,** G. — Raising of existing weirs. (France) (F.)

4. **Marten,** E.-D. — The raising of existing weirs contrasted with dredging, as a means of obtaining an increase in the navigable depth of channels. (Great-Britain) (E.F.)

Second Question. — *Consolidation of weir foundations.*

5. **Roloff,** E. — Consolidation of weir foundations. (Germany) (G.F.)

6. **Fendius,** E. — Consolidation of weir foundations. (Belgium) (F.)

7. **Pavie,** G. — Consolidation of weir foundations. (France) (F.)

N. B. — (1) The name of a country in brackets coming after the title of a report refers to the nationality of the writer.

(2) The letters E., F. or G., in brackets, refer to the language in which the report was published, (E.) signifies English, (F.) French and (G.) German. The first letter in the bracket indicates the language in which the original report was written.

THIRD QUESTION. — *Utilization of the fall of water at weirs as a motive power.*

8. **Roeder.** — Utilization of the fall of water at weirs as a motive force. (Germany) (G.F.)

9. **Hirsch,** J. — Utilization of the fall of water at weirs as a motive force. (France) (F.)

10. **Marten,** E.-D. — On the utilization of the fall of water at weirs as a motive force. (Great-Britain) (E.F.)

FOURTH QUESTION. — *Resistance to the movement of boats.*

11. **Flamm,** O. — Tractional resistance of vessels. (Germany) (G.F.)

12. **Suppan,** C.-V. (Cap.) — Tractional resistance of vessels. (Austria) (G.F.)

13. **de Mas,** B. — Tractional resistance of vessels. (France) (F.)

SECOND SECTION

Inland navigation canals.

FIRST QUESTION. — *Modes of mechanical traction along canals.*

14. **Cröhe.** — Methods of mechanical traction on canals. (Germany) (G.F.)

15. **Chenu,** E. — The traction of vessels on the canal from Charleroi to Brussels. (Belgium) (F.)

16. **De Schryver,** F., and **Zone,** J. — Methods of mechanical traction on canals. (Belgium) (F.)

17. **La Rivière,** G., and **Bourguin,** M. — Methods of mechanical traction on canals. (France) (F.)

18. **de Bovet,** A. — The towage of single vessels on canals. (France) (F.)

SECOND QUESTION. — *Single lock-gates.*

19. **Schnapp.** — Single lock-gates. (Germany) (G.F.)

20. **Pirot,** L. — Single lock-gates of the falling type. (Belgium) (F.)

21. **La Rivière** and **Barbet.** — Locks with a single gate. (France) (F.)

22. **The Hungarian State Water Survey Department.** — Rolling gate of the lock at O'Bechse. (Hungary) (F.)

23. **Deking-Dura.** — Locks with a single gate on the canals of the province of Over-Yssell. (Netherlands) (F.)

24. **de Hoerschelmann,** E.-F. — Locks with a single gate on the navigable canals of Russia. (Russia) (F.)

THIRD QUESTION. — *Means of securing the water-tightness of the bed and banks of a canal.*

25. **Mathies.** — Means of preventing leakage in the bed and banks of a canal. (Germany) (G.F.)

26. **Cenard,** H. — Works for the prevention of leakage carried out on the canal du Centre. (Belgium) (F.)

27. **Lefebvre,** E. — Works for the prevention of leakage carried out on the canal from Charleroi to Brussels. (Belgium) (F.)

28. **Melotte.** — Works for the prevention of leakage carried out on the canal from Maestricht to Bois-le-Duc. (Belgium) (F.)

29. **Barbet,** L. — Means of preventing leakage in the bed or banks of a canal. (France) (F.)

FOURTH QUESTION. — *Mechanical lifting from reach to reach of water supplying a canal.*

30. **Rudolph,** A. — Mechanical raising from reach to reach of the water supply of a canal. (Germany) (G.F.)

31. **Calliot.** — Mechanical raising from reach to reach of the water supply of a canal. (France) (F.)

THIRD SECTION

Tidal rivers and ship canals.

First Question. — *Formulary of characteristic particulars about a tidal river.*

32. **Franzius,** L. - - Characteristic particulars of a tidal river applying specially to the Weser. (Germany) (G.F.)

33. **Bubendey,** J.-F., and **Buchheister,** M. — Characteristic particulars of a tidal river, applying specially to the Elbe. (Germany) (G.F.)

34. **Vandervin,** H. — Characteristic particulars of a tidal river. (Belgium) (F.)

35. **Crahay de Franchimont.** — Characteristic particulars of a tidal river. (France) (F.)

36. **Vernon Harcourt,** L.-F. — Formulary of the characteristic particulars about a tidal river with application to the rivers Hooghly and Mersey. (Great-Britain) (E.F.)

37. **Ramaer,** J.-C. — On the improvement of tidal rivers and the particulars that should be collected to characterise it, applying specially to the waterway from Rotterdam to the Sea. (Netherlands) (F.)

Second Question. — *Modes of cubature of tidal volumes.*

38. **Narten,** G. — Methods of mensuration of tidal volumes and their special application to the Elbe. (Germany) (G.F.)

39. **Vandervin,** H. — Methods of mensuration of tidal volumes. (Belgium) (F.)

40. **Crahay de Franchimont.** — Methods of mensuration of tidal volumes. (France) (F.)

THIRD QUESTION. — *Means of consolidation of ship-canal banks.*

41. **Fülscher.** — Means of consolidation of ship-canal banks. (Germany) (G.F.)

42. **Gerhardt,** P.—Means of consolidation of ship-canal banks. (Germany) (G.F.)

43. **Eich.** — Means of consolidation of ship-canal banks from the tests made at the time of the improvement and deepning of the ship-canal between the Baltic Sea and Stettin. (Germany) (G.F.)

44. **Crenier.** — Means of consolidation of ship-canal banks. (Belgium) (F.)

45. **Hunter,** W.-H. — Means of consolidation of ship-canal banks. (England) (E.F.)

FOURTH QUESTION. — *Dredging.*

46. **Germelmann.** — Dredging in Germany. (Germany) (G.F.)

47. **Van Gansberghe,** L. — Dredging of the tidal portion of the Scheldt. (Belgium) (F.)

48. **Bates Lindon,** W. — High-powered dredges and their relations to sea and inland navigation. (United States) (E.F.)

49. **Desprez,** H. — Dredging in tidal rivers. (France) (F.)

50. **Voisin,** J. — Dredging operations in Boulogne harbour. (France) (F.)

51. **Massalski,** J. — Recent improvements in high-powered dredgers. (France) (F.)

52. **Wheeler,** W.-H. — The use of sand-pump dredgers for the improvement of tidal channels. (Great-Britain) (E.F.)

53. **Smulders,** A.-F. — Recent improvements in high-powered dredgers. (Netherlands) (F.)

54. **de Timonoff,** V.-E. — Suction dredgers. (Russia) (F.)

FOURTH SECTION

Seaports.

FIRST QUESTION. — *Warehouses and sheds.*

55. **Meyer,** A.-F. — Goods yards and warehouses in seaports. (Germany) (G.F.)

56. **Vétillart,** H., and **Ducrocq,** Th. — Goods yards and warehouses in Havre and in seaports generally. (France) (F.)

57. **de Jongh,** G.-J. — Goods yards and warehouses in seaports. (Netherlands) (F.)

58. **Lambrechtsen van Ritthem,** C.-L.-M. — Goods yards and warehouses in seaports. (Netherlands) (F.)

SECOND QUESTION. — *Relative surfaces of the different parts of a seaport.*

59. **Buchheister,** M. — Relative areas of the different parts of a seaport with special reference to the marine installations at Hamburg. (Germany) (G.F.)

60. **Nyssens-Hart,** J. — Relative areas of the different parts of a seaport. (Belgium) (F.)

61. **Guérard,** A. — Relative areas of the different parts of a seaport. (France) (F.)

62. **de Jongh,** C.-J. — Relative areas of the different parts of a seaport. (Netherlands) (F.)

THIRD QUESTION. — *Free ports.*

63. **Charguéraud,** A. — The free ports. (France) (F.)

FOURTH QUESTION. — *Single lock-gates.*

64. **Schultz,** H.-W. — Locks with a single gate for marine works. (Germany) (G.F.)

65. **Piens,** C. — Locks with a single gate fitted to the sea-lock of the new Bruges canal. (Belgium) (F.)

66. **Tutein-Nolthenius,** R.-P.-I. — Locks with a single gate on the lock of Andel. (Netherlands) (F.)

FIFTH SECTION

Tolls, dues and local charges.

First Question. — *Maritime tolls, dues and local charges. Mode of collection.*

67. **Hertogs.** — Maritime taxes and tolls. (Belgium) (F.)

68. **Flamant,** A. — Taxation and tolls in Algerian ports (France) (F.)

69. **Charguéraud,** A. — Maritime taxes and tolls. (France) (F.)

Second Question. — *Unification of the measurement system of boats for inland navigation.*

70. **Schromm,** A. — Unification of the system of guaging the tonnage of vessels on inland waters. (Germany) (G.F.)

71. **Derome,** M. — Unification of the system of guaging the tonnage of vessels on inland waters. (France) (F.)

COMMUNICATIONS.

72. Note on the Port of Antwerp. (Belgium) (F.)

73. **Salvagne,** P. — The maritime portion of Antwerp. (Belgium) (F.)

74. **Hersent,** H., and **Son.** — On the construction of new masonry wharves above Antwerp. (France) (F.)

75. **Society of marine installations of Bruges.** — The outer and inner ports of Bruges. (Belgium) (F.)

76. Note on the technical work carried out by the European Committee of the Danube (1856-1897). (F.)

77. **Iszkowski,** R. — Paper on the question of regulating the course of rivers with a shifting channel, especially with regard to the silting up of old arms of the stream. (Germany) (G.)

78. **Cherassimoff,** N. — The system of direct haulage of vessels by cables. (Russia) (F.)

79. **Denèfle** and **Compy.** — Not on the electric traction, propulsion and haulage of vessels on waterways. (Belgium) (F.)

80. **Polkowski,** I. — On the calculations regarding lock gates. (Russia) (F.)

81. **Kanalverein für Niedersachsen.** — Map and longitudinal section of the great Central canal, joining the Rhine, the Weser and the Elbe, with notes. (Germany) (G.F.)

82. **Seibt,** Prof., Dr W. — Note on automatic fluviometres and on the ratio of their results with levels of the first order. (G.)

83. **Le Brun, R.** — Notes on various phenomena noted in streams with shifting bottoms. (France) (F.)

84. **da Costa Couto,** A.-J. — Improvements obtainable at the mouths of slow running rivers, subject to slight tides and with a shifting bottom, especially as regards the bar of the Rio Grande do Sul. (Brasil) (F.)

85. **Uttini,** E. — Methods of consolidating the banks of canals and rivers. (Belgium) (F.)

86. **Bailey,** W.-H. — Description of a dynamometer for measurement of wave stroke. (Great-Britain) (E.)

87. New marine installations at the port of Lisbon. (Portugal) (F.E.G.)

88. **Bay,** E.-L. — Position of a seaport on a canalized river passing through a large town. (Belgium) (F.)

89. **International School of lightermen of Antwerp.** — Suggestions by the Belgian barge industry. (Belgium) (F.)

90. Suggestions put forward by the "Professional league of lightermen of Antwerp." (Belgium) (F.)

91. **Somzée,** L. — Means of prevention and avordance of collisions at sea. (Belgium) (F.)

92. **Hanssen,** E. — The Sunday rest for sailors. (F.)

93. **Critton,** J. — The Sunday rest and the merchant service. (F.)

94. **Heller,** R., **Mager,** W., and **von Schrötter**, H. — Sanitary regulations regarding working in compressed air, apart from diving work. (G.E.F.)

95. **Centralverein tür Hebung der Deutschen Fluss- und Kanalschiffahrt.** — Scheme for the general management of the International Navigation Congresses. (Germany) (G.F.)

VARIOUS PUBLICATIONS.

97. *Vade mecum* for the members of the Congress. (F.)

98. *Daily Bulletin.* (F.E.G.)

99. *Resolutions adopted by the Congress.* Brussels 1898 (F.E.G.)

100. *Annual of the Association of Engineers formerly members of the specail schools attached to the University of Ghent.* Report on the proceedings of the Congress. 1898. (F.)

101. *Report of the proceedings of the Congress.* (Brussels 1898.) (F.)

102. *Report of the French delegates on the proceedings of the Congress.* Paris. 1900. (F.)

CONCLUSIONS

ADOPTED BY THE VIIth CONGRESS

FIRST QUESTION. --- **Raising of existing weirs.**

CONCLUSIONS ADOPTED :

1. The raising of the water-level retained by a movable weir, within limits not usually exceeding 1 feet 8 inches to 2 feet, is easily accomplished at a reasonable cost, and can be carried out by the ordinary methods, without hindrance to navigation, whatever may be the system of weir.

2. The essential conditions which the transformed weir should fulfil, are :

A sill affording a perfect guarantee of stability, and anchorages capable of resisting the increase in the strains resulting from the raising of the water-level of the reach, and from the alterations in the appliances for closing the weir.

3. In cases where the sill or anchorages are of inadequate strength, the extent of the work is considerably increased; and in order to maintain the navigation, it becomes necessary to construct cofferdams of the ordinary type, or to employ water-tight caissons, or even to resort to compressed-air foundations.

4. The raising of the water-level augments the difficulty of working the weir, and necessitates a more thorough supervision if it is desired to avoid the flooding of riparian lands : it possesses however, on the other hand, the very great advantage of enabling the weir to be less frequently opened or closed, with great benefit to navigation and the preservation of the works.

5. The increase of depth effected by dredging, combined with the rectification of the banks, may under certain conditions of the regime of a river, furnish a satisfactory solution, as shown by the results obtained upon the Severn in England.

SECOND QUESTION. — **Consolidation of weir foundations.**

CONCLUSIONS ADOPTED :

1. The exact determination of the causes to which leakages through, or along the edges of a sill are to be attributed, lead at the same time to the solution of the difficulties which it is proposed to remedy.

2. The method consisting in utilizing the upstream pressure for closing the vents, by introducing into them materials able to block them up, has proved efficacious and adequate in certain instances, notably on the Belgian Meuse, where most excellent results have been obtained by the employment of mats of lead.

It would be unwise to regard this process as universally applicable, its success being often due to special conditions, and the great care bestowed on its execution.

3. If, therefore, a durable and assured protection is required, it is necessary to have recourse to thoroughly water-tight protective works, carried down to a sufficient depth on the upstream side of the sill.

Metal piles and sheeting, the use of which have been advocated, may, according to his view, prove serviceable, if experience confirms the facilities of carrying out and the perfect water-tightness claimed for them by their promotors.

4. The defence of the downstream side of the sills, which, on certain rivers, constitutes an important inconvenience in the maintenance of the works, can be readily secured by the construction of a masonry apron, shaped so as to lessen the effect of the current and eddies, whilst preserving the requisite conditions of resistance for the sill itself.

THIRD QUESTION. — **Utilization of the fall of water at weirs as a motive power.**

CONCLUSIONS ADOPTED :

The Congress considers that it is expedient .

a) To urge engineers to investigate the means of applying the power of the falls of water on canalized rivers, to the working

of the machinery of weirs and locks, as well as to the traction of boats when traversing the passes and locks.

b) To retain on the programme of the next Congress the investigation of the processes suitable for utilizing the available power resulting from the existence of canalization works, for the mechanical or electrical traction of boats, not merely under ordinary conditions, but also in flood-time.

The Congress expresses the hope that the power of the falls of water will be reserved in principle for serving the navigation, and will only be alloted, after much circumspection, in the first place to public purposes, and afterwards to private concerns.

FOURTH QUESTION. — **Resistance to the movement of boats.**

CONCLUSIONS ADOPTED :

In view of the considerable interest attaching to the experiments on the resistance of boats to traction, and the importance of the results already obtained, the Congress considers it desirable to continue the investigations, with boats and by the help of models simultaneously, so that the one set of experiments may be checked by the other.

These experiments should be carried out on open water, as well as on rivers and canals; and account should be taken of all circumstances which may be of practical interest.

The twofold result will thus be attained

1. Of determining the best form for boats for inland navigation, according to the service for which they are destined.

2. Of determining rationally the general cross section of canals, in accordance with the type of boats intended to navigate them.

The Congress, moreover, trusts that the governments and the navigation companies will be good enough to continue their assistance in these interesting researches.

SECOND SECTION

Inland navigation canals.

FIRST QUESTION. — **Modes of mechanical traction along canals.**

The second Section, after having heard the explanations given by the various authors of the reports on mechanical traction, and having discussed the various processes tried since the Hague Congress, has thought it necessary to select a certain number of results from the trials made, which may serve to guide future investigations and experiments. These results are as follows :

CONCLUSIONS ADOPTED :

1. Traction of barges in trains (by tugs and towing vessels) must be reserved for rivers and canals with long reaches of large cross section, and having locks sufficiently large to receive a whole set of boats together, and also for special portions of the water-way, such as tunnels, or sections presenting exceptional inconveniences.

2. On canals of more limited cross section, like those of France and Belgium (ship-canals excepted), traction singly should be adopted, to avoid all loss of time and stoppages, both in making up trains and in passing through the locks.

3. The average speed of navigation must be determined in relation to the cross section of the canal, and of the boats to be towed, so that the strain of traction may not be excessive.

4. In determining the maximum speed, and the method of traction to be adopted, the nature of the banks, with regard to the stability of the slopes, must be taken into account.

5. Along special portions, where traction by horses is difficult but supervision is easy, mechanical traction is still more advisable than elsewhere: ordinary or electrical towage and rope haulage have given very good results, and each of these systems can be adopted, according to the local conditions.

6. Along the general course of a canal, a sure and economical source of motion must be placed at the disposal of all the boats

for an undefined distance, and be always available for the boatman, without being invariably attached to the boat. Boats having on board their motive force, can, however, be employed for regular services possessing an assured traffic, with rapid loading and discharging.

7. The travelling cable has furnished good results in its application to two special lengths : it is to be hoped that its application, as announced to take place soon, on a large scale, along 19 miles of the canal from Dortmund to the Ems, will enable a definite judgement to be formed of the practical value of the system on the ordinary course of a canal.

8. Electrical towage singly, on the Bovet system, has been the subject of an interesting experiment : it is desirable that it should be experimented upon on a larger scale, to ascertain its economic value.

9. Electrical haulage, on the Galliot-Denèfle system, after prolonged trials which have proved the excellence of its working from a technical point of view, is at the present time being applied on a large scale, which will enable its practical and economic value to be determined.

Summing up, the Congress states that since the Hague Congress, the mechanical traction of boats on inland canals has formed the subject of varied and interesting investigations, and that new systems have been, or are about to be tried, on a large scale.

But, inasmuch as the estimation of the technical and economic value of the processes examined, or submitted to experiment, demands the careful examination of a collection of data and of complex special and local circumstances, the second Section is of opinion that before arriving at definite conclusions in the relative value of each of the systems of mechanical traction investigated up to the present time, it is indispensable to await the results of the experiments in progress, or about to be commenced.

Consequently, the Congress expresses the hope:

1. That the proper authorities will offer every encouragement to trials, on a large scale, of the methods of mechanical trac-

tion which may appear to them capable of affording the best practical results.

2. That detailed and comparable returns of the experiments on the mechanical traction of boats on inland canals will be presented at the next Congress, drawn up in accordance with a programme clearly laid down by the organizing Committee.

SECOND QUESTION. — **Single lock-gates.**

CONCLUSIONS ADOPTED:

1. Lock gates which are lowered down, present the essential advantages of single gates. They are expedient for the upper gates, and for protecting gates. They are inexpedient for the lower gates, owing to their great height, and the difficulty of inspecting parts always under water.

2. Rolling gates reduce the length of the side walls; but, on the other hand, they necessitate the construction of a special gate chamber. They appear to be suitable for closing very wide locks, and where the falls are very large and variable.

3. Lifting gates possess the general advantages of single gates, and offer the same economy of masonry as rolling gates. On the other hand, however, they require cumbrous and costly machinery for working. It is well to restrict them to canal lifts and discharging sluices.

4. Single gates turning on a pivot claim the attention of engineers. Nowithstanding the lengthening of the lock which they involve, they are not more expensive than mitred gates; they are subject to less strain, cause less loss of water, are more easily adjusted, repaired, and replaced; and their working is simpler and more regular. Nevertheless, the great expenditure of water, and the increase in the period of locking, resulting from the elongation of the chamber, are inconveniences which, as regards the lower gates, may in certain cases counterbalance, and even outweigh the advantages mentioned above.

5. The choice of system of single gates does not necessarily imply the installation of mechanical appliances. These gates

can be worked by hand by one man alone, without undue strain, and within a period quite allowable in practice.

The mechanical appliances for working, actuated by water under pressure, by electricity, or by a turbine, and transmitted by gearing, are justifiable on canals with a large traffic; and the services they render are far from being disproportionate to their relatively high cost.

The discussions have led the Congress to express the hope that the programme of questions for the next Congress will include a comparison between metal gates and wooden gates, as regards their initial cost, the cost of maintenance, their durability, and the facility of repairs and of working them.

THIRD QUESTION. — **Means of securing the water-tightness of the bed and banks of a canal.**

CONCLUSIONS ADOPTED:

1. The water-tightness of the bed and banks of a canal has more especially to be considered in the design and execution of the works.

2. On existing canals, the choice between the various systems of stopping leakage depends essentially upon local conditions, particularly the height of the banks, the nature of the strata traversed, and the navigation level compared with the level of the subterranean waters or of floods.

3. When an abundant supply of water is available, and there is no immediate necessity to make the bed of the canal water-tight, the deposition of silt may give good results, if the fissures in the permeable soil are of small size.

4. Puddle constitutes a very efficient means of stopping leakages in embankments, and in cases where the soil is subject to settlement. It is generally cheaper than concrete work, and is very suitable for stopping local leaks, particularly in the form of trenches made in the banks. Under the same conditions, compression may equally conduce to water-tightness.

5. Concrete work gives very good results when laid upon incompressible soil, and when suitably protected where requisite

6. A 6-inch layer may be regarded as the minimum thickness for concrete work.

7. A surface coating may be omitted without inconvenience, provided it is used at special places. Generally it suffices to smooth strongly the mortar oozing out at the surface of the concrete.

8. Coating over the concrete layer with coal tar is very serviceable for securing water-tightness.

9. In reaches subjected to periodical under-pressures, whatever method may be adopted for stanching leaks, it may be expedient to counteract the effects of these under-pressures by some arrangement for ensuring the flowing away of the underground water.

FOURTH QUESTION. — **Mechanical lifting from reach to reach of water supplying a canal.**

CONCLUSIONS ADOPTED:

The report presented by Mr. Rudolph proves that the mechanical lifting of the water-supply of a canal from reach to reach forms the subject of important investigations.

Moreover, the report drawn up by Mr. Galliot shows that the provisional installations provided in France on the Briare and Centre canals, and the installations definetely set up on the Burgundy canal, for raising the water from reach to reach, have given relatively advantageous results in practice.

In the present state of the subject, however, no precise conclusions can as yet be arrived at on the question submitted.

The Congress is of opinion that the application of electric energy to the supply of water to canals, by the mechanical lifting of the water from reach to reach, may give advantageous results in certain cases, notably when natural means are available for producing the motive force, or when the installations developing the energy and transmitting it to a distance, can be used at the same time for supplying water to the canal, for the mechanical traction of the boats, as well as for working the locks and the appliances on the quays, and for lighting the water-way.

The Congress expresses the hope that the continued investigations into the supply of water to canals, by mechanically raising the water from reach to reach, will be included on the programme of the next Congress.

THIRD SECTION

Tidal rivers and ship canals.

FIRST QUESTION. — **Formulary of characteristic particulars about a tidal river.**

CONCLUSIONS ADOPTED:

FORMULARY.

Name of the River. — Concise geographical description, indication of the important tributaries discharging into the tidal portion; definition of the outlet.

1st PART. — REGIME OF THE SEA NEAR OUTLET.

1. *Hydrographic chart.* — Cotidal lines.

2. *Sea currents.*

3. *Tidal diagrams, of equinoctial spring tides, of average spring tides, of average neap tides.* — The manner in which the averages are determined should be indicated.

4. *Prevailing winds and storms. — Their influence on the tides.* — Diagram showing the prevalence of the winds. — Height of the waves during storms.

5. *Nature of the sea bottom outside the mouth, and of the adjacent coasts. — Transport of materials; bars; their changes.*

2nd PART. —REGIME OF THE RIVER ABOVE ITS TIDAL LIMIT.

1. *Fresh-water discharge of the river, and of its tributaries, at the low stage, during ordinary floods, during very high floods;*

N. B. — The portions *in italics* denote the data which are considered of the greatest importance : the others indicate useful but less essential information.

mean discharge. — Periods and prevalence of floods. (The gauging stations, and the manner in which the mean discharge has been obtained should be indicated). — Monthly diagrams of the mean, maxima and minima discharges. — Curves of the discharges as functions of the water levels.

2. *Materials carried down by the river; their amount; their nature.*

3rd PART. — REGIME OF THE TIDAL PORTION.

1. *Plans with lines of soundings.* — (Decimal scales; the datum to which the soundings are referred to be stated).

2. *Longitudinal sections.*

Section along a line marked on the plan, showing. —

A. *The lines of high and low water for the tides stated in the 3rd paragraph of the 1st Part, and with a mean fresh-water discharge,*

B. *Instantaneous tidal lines every hour;*

C. *The limits of the propagation of the flood tide.*

Similar particulars for the periods of low stage, and large ordinary floods.

Indications of variations in the bed, either natural, or resulting from works.

Heights of the banks. — Highest water-levels.

3. *Cross sections, with their lines marked on the plans.* — Changes.

4. *Local tidal diagrams at the states of tide given above, and with a mean fresh-water discharge* (the distances between the axes in the abscissæ being made equal, according to the scale, to the distances between the stations, and the hours corresponding). Curves of the velocities of propagation of low water and high water, obtained by joining the extremities of the ordinates of low and high water.

5. Diagrams of the wetted sections below mean low water, and between mean low water and high water (the distances of the stations being the abscissæ), and of the volumes introduced at various places on the river (indicating the state of the tide and the fresh-water discharge corresponding to each diagram).

6. Diagrams, for the stations given in 5, of the discharges and mean velocities per second (deduced from the calculations of the particulars of 5, the distances between the stations being the abscissæ), and of the corresponding wetted sections. Diagrams of the mean velocities as functions of the water-levels.

7. *Velocities observed at various stations*, in various points of the section and at different heights, especially in the lower portion of the river.

8. *Information as to the nature and amounts of the materials carried down.*

9. *Indications as to the changes in the banks and channels.*

10. Saltness of the water.

11. Works executed; their results.

SECOND QUESTION. — **Modes of cubature of tidal volumes.**

CONLUSIONS ADOPTED :

The Congress is of opinion that it is unnecessary to come to a decision on the relative value of the methods employed for calculating the tidal volumes, since the choice depends essentially on the amount of precision required by the engineer in each case.

Nevertheless, considering that the work occupies a very long time which cannot be spared by the engineer, the Congress considers it desirable that the methods adopted should be simple enough to be understood and worked out by his assistants.

Whatever may be the method employed, it is desirable that the sections made use of in each operation should always be taken at the same places, in order to render the results obtained at different periods more comparable.

THIRD QUESTION. — **Means of consolidation of ship-canal banks.**

CONLUSIONS ADOPTED :

The Congress considers that in canals traversed by sea-going vessels at a considerable speed, and also possessing a large inland traffic, it is expedient to protect the banks sufficiently to enable ships to navigate the canal at the highest speed com-

patible with the relation between their largest cross section below the water-level and the water-section of the canal.

Amongst the different systems employed or proposed for the protection of the canal banks, the preference should be given to stone pitching carried down to a sufficient depth. Nevertheless in certain special cases a vertical protection, especially timber sheeting, can be advantageously employed.

FOURTH QUESTION. — **Dredging.**

CONLUSIONS ADOPTED :

Suction dredgers possess a notable superiority both in power and economy in soils which can be readily put in suspension. When the dredged material does not settle down quickly these dredgers cannot be advantageously employed unless the material can be deposited by pumping it through pipes. This type of dredger moreover is capable of working in a greater amount of swell than other dredgers. The contrivances employed or proposed for disintegrating compact materials so as to render them capable of being pumped up are worthy of being investigated with the greatest care, but have not yet been sufficiently employed to enable the Congress to decide upon their value.

Bucket-ladder dredgers can work in almost any kind of material; but they are specially applicable to compact, hard and variable strata. They are consequently serviceable in a number of instances concurrently with large single bucket dredgers, grate dredgers, etc.

These last types of dredgers have not yet furnished the subject of any reports presented to the Navigation Congresses and it would therefore be desirable that they should be amongst the questions to be considered by the next Congress as dredging always forms a part of the deliberations of these Congresses.

The Congress expresses the hope that in future reports engineers will take special care to define exactly the conditions under which the quantities dredged have been ascertained and the cost determined, in order to render the particulars given about these matters as comparable as possible.

FOURTH SECTION

Seaports.

First Question. — **Warehouses and sheds.**

CONCLUSIONS ADOPTED :

Considering the preponderating influence which variable elements in the different ports, especially the nature of the traffic and the commercial customs, must have on the conditions of the establishment of quays and warehouses, the Congress is of opinion that there is no occasion to draw up general rules with regard to these conditions of establishment, as the arrangements adopted in each particular case are of interest solely by way of indication for analogous cases.

Second Question. — **Relative surfaces of the different parts of a seaport.**

CONCLUSIONS ADOPTED :

The Congress proposes that the following question should be put amongst the list of subjects to be considered by the next Congress :

To seek by the nature of the traffic—both special and general traffic — the possible utilisation of the installations, for this purpose, of the ports; to give the diagram of the variations in the extent of the traffic, and to deduce from it rules enabling the dimensions of the different parts of a port to be determined, when its probable traffic is known, and to regulate the extension of existing ports, when the probable development of the various branches of commerce is known.

Third Question. — **Free ports.**

CONCLUSIONS ADOPTED :

As a free port owes its origin to the economic regime adopted, the Congress considers that there is no reason for the Congress to pass any resolution on this subject.

On account, however, of the influence which the same regime might have, according to the details of its application, on the commercial activity of a port, and on the rapidity of the operations of loading and discharging which are carried on there, the Congress thinks that the study of the question might be continued under the following form:—

" Means employed for securing, developing or facilitating, with a given commercial regime, the commercial operations in seaports. "

FOURTH QUESTION. — **Single lock-gates.**

CONCLUSIONS ADOPTED :

Single gates offer in general important advantages for sea locks.

FIFTH SECTION

Tolls, dues and local charges.

FIRST QUESTION. — **Maritime tolls, dues and local charges. Mode of collection.**

When the levying of tolls in a seaport has been decided upon, it is advisable to frame these tolls, both as regards their assessment and their amount, on as varied a basis as possible, so as to secure for them the maximum suppleness and flexibility.

It is especially useful to include in the assessment of the tolls: the dimensions of the vessel, the quota of its freight, the nature and importance of the operations carried out by it in the port, the length of stay which it makes, and the positions it occupies there. The price can be graduated according to the class of the navigation, and the nature of the marchandise. The authorities entrusted with the administration of the tolls can, under these conditions, apply them in the manner most appropriate to the different commercial conditions of the port.

SECOND QUESTION. — **Unification of the measurement system of boats for inland navigation.**

CONCLUSIONS ADOPTED :

The Congress declares that the reform elaborated by the International Conference of Brussels of 1896, with reference to the navigable water-ways of Germany, Belgium, France and the Netherlands, is of great interest in every respect. It expresses the hope that the regulations to be introduced for carrying this reform into effect, may be settled and put in force with as little delay as possible.

The Congress trusts that the States of Central and Eastern Europe, will come to an agreement as to the bases of a system of uniform measurement of boats for inland navigation.

In accordance with these views, it is desirable that the agreements still to come in, will approximate as nearly as possible to the agreement adopted by the western States.

COMMISSION OF STUDIES

FOR THE

ELABORATION OF A SCHEME OF PERMANENT ORGANISATION

FOR THE

INTERNATIONAL NAVIGATION CONGRESSES

RESOLUTION ADOPTED:

A Commission of studies has been instituted to prepare a scheme for the permanent organisation of the International Navigation Congresses. (1)

This Commission consists of the Board of the VIIth International Navigation Congress, to which are associated the promotors of the anterior Congresses: MM. Gobert, Marshall-Stevens, Merkens, Quinette de Rochemont, Vernon-Harcourt, Wittich.

The Commission is entitled to adjoin to itself members from all countries.

The Commission will present a report about its activity to the next Congress. (2)

---

(1) It is of interest to note, that at the first International Congress of Inland Navigation held in Brussels, in 1885, the idea of a Permanent International Committee was put forward, and the idea was most favourably received. From the official report, the question was proposed by President Somzée on the 30th May, during the course of the penultimate sitting of the Congress. See « Souvenirs de neuf Congrès de Navigation » page 1, by F. D. de Mas, Inspecteur général des Ponts et Chaussées, Member of the Permanent International Committee of the Navigation Congress.

(2) The VIIIth International Navigation Congress will be held in Paris, 1900.

The Committee of Studies was finally composed as follows:

I

Committee of the VIIth International Navigation Congress.

Chairmen :

Messrs.

Belgium. — HELLEPUTTE (Georges), Ingénieur honoraire des Ponts et Chaussées, Professeur à l'Université de Louvain, Membre de la Chambre des Représentants;

DE ROTE (Léon), Directeur général des Ponts et Chaussées.

Vice-Chairmen :

Messrs.

Argentine Republic. — DUCLOUT (Georges), Inspecteur général au département des Ingénieurs civils.

Austria. — RUSS (Dr. Victor), Reichrats-und Landtags-Abgeordneter;

ZERBONI-SPOSETTI (Max von), k. k. Ministerialrat.

China. — CHEN NGEN TAO, Commandant de vaisseau, Attaché naval à la Légation de Chine, à Londres.

Congo (Free State). — WANGERMÉE (Emile), Capitaine-Commandant du Génie, Vice-Gouverneur général de l'Etat Indépendant du Congo.

Denmark. — OTTERSTROM (Christian), Directeur des travaux maritimes de l'Etat danois.

Danube (European Committee of the) —LOEHR (J. de), Délégué d'Allemagne et Président de la Commission Européenne du Danube.

Messrs.

France. — HOLTZ (Paul), Inspecteur général des Ponts et Chaussées, Président de la Délégation du Gouvernement français.

COUVREUR (Louis), ancien Vice-Président de la Chambre de Commerce de Paris, Vice-Président de la Délégation du Gouvernement français.

Germany. — SCHULTZ (Alfred), Excellenz, Königlich Preussischer Ministerial-Direktor, Wirklicher Geheimer Rat;

FRANZIUS (Ludwig), Oberbau-Direktor der freien und Hansestadt Bremen.

Great Britain. — FERGUSSON (Sir James), Baronet, Member of Parliament;

HAWKSHAW (John Clarke), Civil Engineer, M. A., M. Inst. C. E.

Holland. — CONRAD (J.-F.-W), Ancien Inspecteur général du Waterstaat, Membre de la seconde Chambre des Etats-Généraux, Président du «Koninklijk Instituut van Ingenieurs».

Hungary. — CSORGEO (Jules de), Secrétaire d'Etat au Ministère du Commerce.

Italy. — ROTA (Chevalier Joseph), Ingénieur en Chef du Génie naval.

Japan. — ITO YOSHIGORO, Capitaine de vaisseau, Attaché naval à la légation du Japon à Paris.

Liberia (Republic of). — STEIN (Baron Adolphe de), Chargé d'affaires.

Monaco (State of). — ROBYNS DE SCHNEIDAUER (François), Chargé d'affaires honoraire, Consul général.

Messrs.

Norway. — SAETREN (Gunnar), Directeur de l'Administration des canaux.

Portugal. — MENDES GUERREIRO (Jean Verissimo), Ingénieur en chef des Travaux publics, Directeur des Edifices publics.

Roumania. — DUCA (G.), Inspecteur général des Ponts et Chaussées, Directeur des travaux du port de Costantza.

Russia. — GHERCEVANOF (Michel), Directeur de l'Institut des Ingénieurs des Voies de Communication;

TIMONOFF (V.-E. de), Conseiller d'Etat, Professeur agrégé et Secrétaire du Conseil de l'Institut des Ingénieurs des Voies de Communication.

Spain. — CHURRUCA (Evaristo de), Ingénieur en chef du Corps national des Routes, Canaux et Ports, Directeur des travaux du port de Bilbao;

ORTUÑO (Emilio), Ingénieur, Professeur à l'Ecole spéciale des Routes, Canaux et Ports de Madrid.

Sweden. — BERG (Lars), Directeur général des Ponts et Chaussées.

Switzerland. — MORLOT (Albert de), Inspecteur en chef des Travaux publics de la Confédération suisse.

United States. — BIDDLE (John), Capitain, Corps of Engineers, United States Army;

CORTHELL (Elmer-Lawrence), Civil Engineer.

General Secretary :

Messrs.

Belgium. — DUFOURNY (Alexis), Ingénieur en chef, Directeur des Ponts et Chaussées.

Secretaries .

Messrs.

Germany. — PESCHECK (Ludwig), Königlich Preussischer Oderstrom-Baudirektor, Geheimer Baurat.

Austria. — KUHN (Richard), k. k. Oberingenieur im hydrotechnischen Bureau des k. k. Handelsministerium.

European Committee of the Danube. — PAILLARD-DUCLERE (Constant), Ministre plénipotentiaire, Délégué de la France à la Commission européenne.

France. — BARLATIER DE MAS (Fernand), Ingénieur en chef des Ponts et Chaussées, Professeur à l'Ecole Nationale des Ponts et Chaussées.

Hungary. — ROEDIGER (Ernst), Sektionsrat.

Russia. — HOERSCHELMANN (E.-F. de), Conseiller d'Etat, Chef adjoint de la Direction des Voies de Communication de Kieff.

Assistant Secretaries .

Messrs.

Belgium. — LAMBIN (Albert), Ingénieur des Ponts et Chaussées, Secrétaire du Cabinet du Ministre de l'Agriculture et des Travaux Publics;

CRISTOPHE (Paul), Ingénieur des Ponts et Chaussées

II

Assistant Members .

Messrs.: DEBEIL (Alphonse), Inspecteur général des Ponts et Chaussées, à Bruxelles.

GOBERT (Auguste), Ingénieur honoraire des mines à Bruxelles.

MARSHALL-STEVENS (F. S. S.), à Manchester.

MERKENS (Franz), à Cologne.

PAVIE (Georges), Ingénieur en chef des Ponts et Chaussées, Secrétaire général du VIII[e] Congrès International de Navigation, à Paris.

QUINETTE DE ROCHEMONT (B[n]), Conseiller d'Etat, Inspecteur général des Ponts et Chaussées, Directeur des Routes, de la Navigation et des Mines, à Paris.

VERNON-HARCOURT (Leveson-Francis), M. A., M. Inst. C. E., à Londres.

WHEELER (William Henry), M. Inst. C. E., a Boston (Lincolnshire).

WITTICH (Franz), Geheimer Regierungsrat, a Charlottenburg (Berlin).

INTERNATIONAL

NAVIGATION CONGRESS

VIIIth Congress

Paris 1900

PROGRAMME OF THE PROCEEDINGS OF THE CONGRESS

FIRST SECTION

Inland Navigation : Works entailed.

First Question. — **Influence of training works on the regime of streams and rivers.**

Show more especially the influence such works have in times of flood.

Second Question. — **Progress in mechanical methods of supplying water to canals.**

Additional Question. — **Prevention of stoppages.**

SECOND SECTION

Inland Navigation : Management.

Third Question. — **Utilization of natural navigable waterways of slight depth beyond their maritime portion.**

Methods of administration, and shallow draft plant more especially available for colonial use.

FOURTH QUESTION. — **Progress of the application of machinery to traction on waterways. Monopoly of traction rights.**

FIFTH QUESTION. — **Provident and instructional institutions for the working staff of inland and raft navigation.**

THIRD SECTION

Maritime Navigation : Works entailed.

SIXTH QUESTION. — **The most recent progress of lighthouses and beacons.**

SEVENTH QUESTION. — **The most recent works at some of the principal seaports and harbours.**

FOURTH SECTION

Maritime Navigation : Administration.

EIGHTH QUESTION. — **On the adaptation of harbours to the requirements of modern mercantile shipping.**

NINTH QUESTION. — **Improvements in mechanical appliances for the working plant of ports.**

NAMES OF THE REPORTERS

AND

TITLES OF THE REPORTS SUBMITTED TO THE VIIIth CONGRESS

FIRST SECTION

Inland Navigation : Works entailed.

First Question. — *Influence of training works on the regime of streams and rivers.*

1. **Bindemann,** H. — Influence of training works on the regime of streams and rivers. (Germany) (G.E.F.)

2. **Grenier,** L. — Influence of the training works of the Scheldt on the regime of that river. (Belgium) (F.E.G.)

3. **Jacquemin**, E., and **Marote,** E. — Influence of training works on the regime of the Meuse and Lower Ourthe. (Belgium) (F.E.G.)

4. **Robert,** A. — Influence of training works on the regime of rivers. (France) (F.E.G.)

5. **Tutein-Nolthenius**, R.-P.-J. — The influence of river improvements on inundations in the Netherlands. (Netherlands) (F.E.G.)

6. **de Kvassay,** E. — Influence of training works on the regime of rivers in Hungary. (Hungary) (F.)

N. B. — (1) The name of a country in brackets coming after the title of a report refers to the nationality of the writer.

(2) The letters E., F. or G., in brackets, refer to the language in which the report was published. (E.) signifies English, (F.) French and (G.) German. The first letter in the bracket indicates the language in which the original report was written.

SECOND QUESTION. — *Progress in mechanical methods of supplying water to canals.*

7. **Schulte.** — Progress in mechanical methods relating to the system of water supply of canals. (Germany) (G.F.)

8. **Hutton,** W.-R. — On the application of machinery to the water supply of canals. (United States) (E.F.)

9. **Calliot.** — Progress in mechanical methods of supplying water to canals. (France) (F.E.G.)

SECOND SECTION

Inland Navigation : Management.

THIRD QUESTION. — *Utilization of natural navigable waterways of slight depth beyond their maritime portion.*

10. **Suppan,** C.-V. — Navigation on shallow streams and rivers. (Austria) (G.E.F.)

11. **Wahl,** A. — Utilization of natural navigable waterways of slight depth beyond their maritime portion. (France) (F.E.G.)

12. **Van Besse,** M.-J. — Utilization of natural navigable waterways of slight depth beyond their maritime portion. (Netherlands) (F.E.G.)

13. **de Timonoff,** V.-E. — Training of large rivers by the mechanical dredging of channels and attraction of the waters. (Russia) (F.E.G.)

FOURTH QUESTION. — *Progress of the application of machinery to traction on waterways. — Monopoly of traction rights.*

14. **Engels,** H. — Resistance of boats under traction. (Germany) (G.E.F.)

15. **Köttgen,** C. — Electrical haulage on canals. (Germany) (G.E.F.)

16. **Thiele,** F. — Effects of navigation upon the bottom and banks of the Dortmund-Ems Canal. (Germany) (G.E.F.)

17. **La Rivière** and **Bourguin.** — Progress of the application of machinery to the working of waterways. Traction monopolies. (France) (F.G.)

18. **Lombard-Guérin.**— Notes on towing on the Rhône. (France) (F.E.G.)

19. **Egan,** E. — Traction of boats on the Iron Gate channel of the Lower Danube. (Hungary) (G.E.F.)

20. **Hoszpotzky,** A. — Experiments made with tugs on the Iron Gate channel. (Hungary) (G.E.F.)

21. **Rota,** G. — On the resistance of boats used for inland navigation. Experiments with models on the same. (Italy) (F.E.G.)

FIFTH QUESTION. — *Provident and instructional institutions for the working staff of inland and raft navigation.*

22. **Just.** — Provident institutions for the working staff of inland and raft navigation. (Germany) (G.E.F.)

23. **Schromm,** A. — Measures of protection and instruction for ships' crews. (Austria) (G.E.F.)

24. **Captier,** G. — Founding of mariners institutions, schools for professional instruction, and provident and relief societies in France. (France) (F.E.G.)

THIRD SECTION

Maritime Navigation : Works entailed.

SIXTH QUESTION. — *The most recent progress of lighthouses and beacons.*

25. **Körte,** W., and **Truhlsen.** — Improvements in the lighthouse establishment in Germany. (Germany) (G.F.)

26. **Millis,** J. — The lighthouse establishment in the United States. (United States) (E.F.G.)

27. **Ribière.** — The most recent progress of lighthouses and beacons. (France) (F.E.G.)

SEVENTH QUESTION. — *The most recent works at some of the principal seaports and harbours.*

28. **Schultz,** H.-W. — Extensions and improvements in the principal German ports during the last few years. (Germany) (G.E.F.)

29. **Lyster,** A.-G. — Works recently carried out and in contemplation at the port of Liverpool. (Great-Britain) (E.F.G.)

30. **Vernon-Harcourt,** L.-F. — The most recent works at some of the principal British seaports and harbours. (Great-Britain) (E.F.G.)

31. **Nyssens-Hart,** J., and **Piens,** Ch. — Construction of the pier of the port-of-call of Zeebrugge. (Belgium) (F.E.G.)

32. **Van der Schueren,** P.-S. — Works recently carried out and in course of construction at the landfall and port of Ostende. (Belgium) (F.)

33. **Garcia-Faria,** P. — Works recently carried out in the ports of Barcelona and Bilbao. (Spain) (F.)

34. **Barbé.** — The most recent works at the principal French ports on the North Sea, the Channel, and the Ocean. (France) (F.E.G.)

35. **Quinette de Rochemont** (Baron). — Note on works carried out at some of the Mediterranean ports. (France) (F.)

36. **Ciaccone,** P. — Notice on the most important works executed in some Italian ports. (Italy) (F.E.G.)

37. **Mendes-Guerreiro,** J.-V. — Works recently carried out at some of the most important coast and maritime ports of Portugal. (Portugal) (F.)

FOURTH SECTION

Maritime Navigation : Administration.

EIGHTH QUESTION.— *On the adaptation of harbours to the requirements of modern mercantile shipping.*

38. **Franzius,** L. — On the adaptation of harbours to the requirements of modern mercantile shipping. (Germany) (G.E.F.)

39. **Corthell,** E.-L. — The harbours of the world, their present and required conditions of navigability, and facilities. (United States) (E.F.G.)

40. **Vétillart.** — Changes in working plant and methods of the merchant service. (France) (F.G.)

NINTH QUESTION. — *Improvements in mechanical appliances for the working plant of ports.*

41. **Delachanal,** E. — Improvements in mechanical appliances for the working plant of ports. (France) (F.E.G.)

---

42. **Committee of study for the elaboration of a scheme for the permanent organisation of International Congresses of Navigation.** — Report presented by the Board of the Provisional Committee. (F.E.G.)

COMMUNICATIONS.

43. **Vauthier,** L.-L. — Note on an improved method of utilizing free running rivers as waterways by means of low-water reservoirs. (France) (F.)

44. **Chamber of Commerce of Namur.** — Suppression of stoppages on canals and canalized rivers. (Belgium) (F.)

45. **de Hoerschelmann,** E.-F., and **Jitkoff,** S.-M. — Educational institutions for the staff of the barge industry. (Russia) (F.)

46. **Ockerson,** J.-A. — The Mississipi River. Some of its physical characteristics and measures employed for the regulation and control of the stream. (United States) (E.F.)

47. **Cay,** W.-D. — Lenses for ships, lights. (Great-Britain) (E.F.)

48. **Bates,** L.-W. — The navigation interests of nations in ports and waterways, and modern means for their improvement. (Great-Britain) (E.F.)

49. **Gérard,** L. — Notes and experiences of electric traction on waterways. (F.)

50. **Rudolph,** A. — Electrical haulage on canals. — A system of haulage. (Germany) (F.)

51. **Doniol.** — Remarks on the system of electrical haulage proposed by Mr. Köttgen. (France) (F.)

52. **Remarks presented** by a group of members of the Congress on the report of Mr. G. Captier, with regard to provident and educational institutions for the staff of the barge industry. (France) (F.)

53. **Chamber of Commerce of Dunkirk.** — Dunkirk, its port and commerce. (France) (F.)

54. **Maritime installations of Belgium.** — Notes on the plans and models exhibited in the hall of the Ponts et Chaussées of the Kingdom of Belgium, at the Exhibition of 1900. (Belgium) (F.)

55. **Vosnessensky,** N. — Note on the waterways, roads and commercial ports of Russia. (Russia) (F.)

56. **Rubin,** V. — The canalisation of the Moldau and the Elbe in Bohemia. — Progress and condition of the works at the beginning of the year 1900. (Austria) (F.)

57. **De Conda** (Béla). — Inland navigation of Hungary. (Hungary) (F.)

VARIOUS PUBLICATIONS.

58. *Information and Documents.* VIIIth Congress. Paris, 1900. (F.)

59. *Annals of the Public Works of Belgium, brief analyses of the studies and reports published on the occasion of the VIIIth Congress.* Brussels, 1900. (F.)

60. *Summary report on the VIIIth Congress.* Paris 1900. (F.)

61. *Reports of the proceedings of the Congress* (1). Paris, 1901. (F.)

(1) The discussions and speeches are reproduced in the report in the original, the translation into French of the German and English matter is given, in the form of notes, at the bottom of each page.

CONCLUSIONS

ADOPTED BY THE VIIIth CONGRESS

FIRST SECTION

Inland Navigation : Works entailed.

FIRST QUESTION. — **Influence of training works on the regime of streams and rivers.**

CONCLUSIONS ADOPTED :

1° The examples mentioned in the reports which have been presented to the Congress prove: that in the cases concerned, the works of regularisation performed for navigation purposes did not raise the flood level, and that favourable results have been attained in regard to the formation and the removal of ice; and if the extreme variety of natural conditions does not allow us to affirm that the same result would happen in every case, it is at least permissible to conclude that there is no clashing between the two essential interests, or only in rare cases.

2° Among the means of improving the natural conditions and navigability of rivers, are the storage reservoirs intended to increase the low-water discharge, and in some special cases, to lessen the height of the floods. Applications of this system have been made very successfully and others are contemplated; this method has, moreover, the advantage of creating reserves of power which are, now-a-days, rendered available by the progress of science, and, therefore, it is worthy of being brought before the attention of engineers and Governments.

3° So long as the dimensions and discharge of rivers increase while their slope diminishes, the application of systems of regulation, that is to say the erection of fixed works, submersible dykes or fascine-dams, result in so large an expense and so great a loss of time, that practically, works of that kind

should be given up altogether. At the same time dredging methods have been so wonderfully improved in the last few years, as to increase on an unexpected scale the power and economy of this process. On main rivers, when their trade is such as to justify it, the use of dredging combined with works for protecting the banks, wherever necessary, and even should such dredging have to be periodically carried out, constitutes a process worthy of consideration, and indeed, the only practicable one. It may even be said that in smaller rivers, and concurrently with fixed works of regulation, dredging can be used to a larger extent than it has been up to the present time.

SECOND QUESTION. — **Progress in mechanical methods of supplying water to Canals.**

CONCLUSIONS ADOPTED :

The water supply of canals, by means of steam-power, has been, in these last years, especially in France, the object of very interesting trials which resulted in the lowering of cost, as much as that method could allow.

Nevertheless, the Congress thinks it advisable so far as the general interest is concerned, to secure by means of an expenditure, which once made will not have to be again incurred the requirements of the future, and to utilise direct the available resources of the soil, by means of reservoirs and of feeder channels.

Where such process could not be carried out, the great progress of electricity will legitimate a system of elevating works borrowing their working power not from fuel brought from far and which may always be useful for other purposes, but from natural waterfalls, even should the same be situated at a distance.

It is also necessary to recommend all means capable of lessening the consumption of water, such as making the banks and weirs watertight; which will have the same effect of lessening future expenditure by an outlay which once made will not have to be repeated.

ADDITIONAL QUESTION. — **Prevention of stoppages.**

CONCLUSIONS ADOPTED :

The Congress, considering that the suppression or at least a very large reduction of the periodical interruptions of navigation is of such high interest that it is needless to insist upon, but looking at it from the only point of view that concerns it, that is to say from the point of view of the question of construction, strongly recommends methods of construction and maintenance fit to attaining such a result.

SECOND SECTION

Inland Navigation : Management.

THIRD QUESTION. — **Utilization of natural navigable waterways of slight depth beyond their maritime portion.**

CONCLUSIONS ADOPTED :

The Congress adopts the following suggestions:

It is adviseable to study:

1. The utilization of the various types of river boats of less than 75 centimetres draught; the shape of the stern of paddle-boats; the form of the screw-envelope in screw steamers; the size and design of the propellers.

2. The diminution of the speed and reduced effect which result from shallow water depth under the bottom of the boat, in comparison with that obtained in deep water.

3. The introduction on screw steamers of shallow draught, of high speed motors, such as: steam turbines on the systems of Parsons, Rateau, etc.

4. The influence on the propulsion or on the hauling power, of several screws on the same shaft instead of a single larger and slower screw on each shaft.

5. The Congress expresses the wish that the next Congress may be furnished with as complete information as possible on the trials made with a view to utilizing on shallow rivers propellers of the kind similar to turbines or helicoidal wheels.

FOURTH QUESTION. — **Progress in the application of machinery to traction on waterways. Monopoly of traction rights.**

CONCLUSIONS ADOPTED :

1° Considering that it is of general interest to improve the means of working canals and especially the development of mecanical traction.

Considering that the different applications of electrical traction, realized in France, Belgium and Germany, justify the hope that practical results will be reached and this independantly of the general advantages that may result from the development of distribution of electrical energy.

The Congress expresses the wish: that the working of electrical traction on portions of canals sufficiently long to give technical as well as commercially conclusive results, should be fully encouraged and facilitated by the public authorities of the different countries.

2° The results of the studies and experiments, made since the Congress of Brussels, for the determination of the tractional resistance of vessels, fully justify the resolution adopted by the last Congress viz: that it is necessary to pursue the investigations and experiments both with vessels and models; the former alone can give absolute and exact figures, the latter enabling us to establish quickly and cheaply the comparison between the different types of boats on the different sections of canals.

FIFTH QUESTION. — **Provident and instructional institutions for the working staff of inland and raft navigation.**

CONCLUSIONS ADOPTED :

It is very desirable and necessary that the International Navigation Congresses should devote in the future more attention to economical and commercial questions, which are of high importance. Accordingly the permanent Commission which is in process of formation should be asked to put such questions on the programme of future Congresses and to take care to obtain reports on these questions.

The Congress proposes that the question of "*Institutions of mutual aid, of protection and professional instruction of the river and canal boats*", be put on the programme of the next Congress, and that in the different countries it be the object of continued studies on account of its high social interest.

THIRD AND FOURTH SECTIONS

Maritime Navigation : Works entailed. Administration.

The Chairmen of the Third and Fourth Sections, considering it difficult to formulate sufficiently precise resolutions, did not call on their Sections to vote.

CONSTITUTION

OF A

PERMANENT COMMISSION

OF THE

NAVIGATION CONGRESSES

Mr. Barlatier de Mas, Inspecteur général des Ponts et Chaussées, on behalf of the Commission of Studies, formed at Brussels, in 1898, at the close of the VIIth Navigation Congress, for the purpose of drawing up a scheme for the permanent organisation of the Navigation Congresses, read, on the 3rd August, 1900, at the final sitting of the VIIIth Congress, the following report, the resolutions cointained therein being unanimously approved of by the meeting. (1)

Report of Mr. Barlatier de Mas.

The Commission of Studies, formed at Brussels, for the purpose of drawing up a scheme for the permanent organisation of the Navigation Congress, met on Monday, the 30 July last, to discuss the resolutions contained in the report presented by the members of the sub-committee: Messrs. Helleputte and de Rote, Chairmen, and Dufourny, General Secretary.

After thanking these gentlemen for the care and labour with which they had worked for the common weal, the Commission considered the work undertaken during the last two years to obtain the desired result; and was pleased to find that a great advance had been made towards a definite organisation of the proposed body. All its members, in fact, are now convinced of its necessity.

(1) See Report of the proceedings of the VIIIth Congress, p.p. 615 to 617.

In a fine speech, which perfectly voiced the general feeling on the subject, the Minister of Public Works, at the opening meeting on Saturday last, showed the great value of a close and permanent inter-connection between the scientists, ship.-builders and business men, who are in various ways connected with navigation.

He, more especially, laid stress upon the fact that the sea is a most excellent means of bringing nations together and insuring their prosperity; he called attention to the rapid progress which might be obtained by united efforts, more especially in regard to realising simultaneously and on all sides, in accordance with a similar programme and a similar point of view, the necessary arrangements, installations and plant required for navigation.

The scope of navigation is wider and more international than that even of railways. It is almost limitless. The advances in shipping and navigation are so great that they revolutionise the world, and one is entitled to say that if, with a view to the unification, co-ordination, and harmonising, in the interests of the public, of their labours and their improvements, the railway companies have found it indispensable to form the permanent international institution which we all know, then there is even more necessity for the existence of a similar body as regards navigation. We must create a bond between the various countries which desire to improve their ports, their rivers and their canals. It is no longer sufficient for the interchange of ideas to take place at chance meetings, for the meetings to be merely accidental and liable to be put off by numerous accidents. The time has come to definitely fix on the rules that shall regulate your society, to place it on a firm and stable basis, to insure it a certain and continuous life, without fear of any occasional collapse, or of any oft-times miraculous resurrection. The general meetings of this Congress must carry on their work from Congress to Congress; *thanks to the formation of a permanent international commission*, on which all countries interested in navigation should be represented

On all these points there was unanimous agreement.

Passing to the consideration of ways and means to be adopted to realise these desiderata, the meeting, after a long discussion,

came to the conclusion that it would be best to transform the present *Commission of Studies* into a *Permanent Commission*, with the proviso that this latter must take steps, when necessary, to replace any of its members who may decease, or who are not officially appointed. *It would then have to draw up its statutes and decide on its attributions*, after each of its members had taken the opinion of, and his instructions from, the body or society whose interests he represents.

If the foregoing proposal should be agreed to and ratified by the full meeting of the Congress, *if the present Commission of Studies is, under the above-mentioned conditions, to be transformed into the Permanent International Commission of the Congress, a Permanent Council must be formed from among its members to facilitate and insure continuity.*

This Council, it is unanimously agreed, *should have its headquarters in Brussels*, which was the birth place of the Navigation Congresses and was where the idea of the permanent organisation of these Congresses, was first mooted.

Messrs. Helleputte, de Rote and Dufourny, the persevering and able promotors of the new body, naturally appear designated to form the nucleus of the Permanent Council. Each country should select a member, and, if thought necessary, an extra member, to assist them in their task.

As we have mentioned above, the Permanent Commission and its Council would primarily have the duty of ensuring the continuous life of the Congress, more especially by selecting, in view of the convenience of all the members, the countries and towns where the meetings of the Congress will take place. It appeared to the Commission that a three-years interval between the meetings would be best.

The Commission of Studies accordingly proposes that the following resolutions should be adopted:

1° The present Commission of Studies, constituted at Brussels, shall become the Permanent International Commission of Navigation Congresses, with the proviso that this latter must take steps, when necessary, to replace any of its members who may decease, or who are not officially appointed.

2° A Permanent Council shall be formed from among its members. It will include Messrs. Helleputte, de Rote and Dufourny, Presidents and General Secretary of the Commission. Each country shall select a member, or if considered necessary, an extra member, to assist them in their work.

3° The Permanent Commission and its Council shall take the necessary steps to decide on the venue at an interval of three years as nearly as possible, of the next Congress.

These conclusions were unanimously approved at a meeting of the whole Congress, on the 3rd August 1900.

Role of the Permanent International Commission

OF

NAVIGATION CONGRESSES

MEETING of the PERMANENT COUNCIL

OF THE

PERMANENT INTERNATIONAL COMMISSION

at Brussels, on the 24th June 1901

In accordance with the resolutions decided upon by the VIIIth Congress, held in Paris, in 1900, the Permanent Commission and its Council were entrusted, with the taking of the necessary steps to decide on the venue, at an interval of three years as nearly as possible, of the next Congress. Messrs. Helleputte and de Rote, Chairmen of the Permanent Council, and Mr. Dufourny, General Secretary, formed an Executive Committee.

With a view to carrying out, as rapidly and completely as possible, the work which had been entrusted to it, the Executive Committee applied to the Ministry of Foreign Affairs of Belgium, and its application received an immediate attention and care which is worthy of note. The Belgian Government immediately gave every assistance, and sent out a very fully drawn-up note to each of the Governments which had taken part in the earlier Navigation Congresses and had sent official delegates. It pointed out the great utility of a permanent Commission whose duty would be the organisation of these Congresses and the defraying of their expenditure. The aim in view is of general and international interest.

The work carried out up to the present is already of importance. Every State possessing a system of waterways, ports, and shipping, has benefited by the discussions and proceedings of

the Congresses; their utility has been shown, in a concrete and material form, in all branches of navigation, both inland and maritime. It is therefore only reasonable that the Permanent Commission should apply to the various States for both moral and pecuniary assistance, and that the profit and expenditure of the society should be proportionally devided among those who have an interest in the matter.

The Permanent Council of the Congress would have heavy expenses to meet in order to carry out its labours, as it had been entrusted with the duty of centralising, so far as is possible, the successive meetings, which would take place, as often as possible, every three years. The expenditure relating to each meeting, instead of falling solely on the country in which the meeting of the Congress took place, would therefore be divided among the various subscribing countries.

Another duty, entrusted to the Permanent Commission and more especially to the Permanent Council and Executive Committee, was to choose the venue of the next Congress. Invitations came from America and Germany.

At the close of the Congress in Paris, it was proposed to hold the next meeting in the United States. The suggestion had since met with approval.

A Bill was brought before the House of Representatives of the United States, with a view to meeting the expense of the IXth Congress. Steps were taken by the official American delegates, to bring the matter forward, but nothing came of it.

Meanwhile a clear and definite invitation from the German Government had been received by the Permanent Council.

In the month of October, 1900, the Communal authorities of Dusseldorf, after having consulted the Government at Berlin, and, officially, the Executive Committee of the International Commission, began to take steps to obtain the necessary means to hold the IXth Navigation Congress at Dusseldorf, during the course of an important district exhibition, which was to take place in that town, in 1902.

The negotiations with the government were at once successful, thanks to the assistance of H. E. Mr. Schultz, the delegate of

Germany on the Permanent International Commission. This high functionary informed the Executive Committee, on the 24th April, 1901, that the Chancellor of the Empire had agreed that the Navigation Congress should be held in Dusseldorf in 1902, and had granted an important subsidy towards it.

Meeting of the Permanent Council of the International Commission of the Navigation Congresses at Brussels.

Accordingly, the Council of the Permanent Commission, the members of whom are given below, held a meeting in Brussels, on the 24th June, to definitely decide where the next meeting of the Congress should take place, the date of its assembly, and the programme to be adopted, not only from the point of view of the subjects to be discussed, the reports and other preparatory work, but also as regards the organisation and the sittings.

Permanent Council of the International Commission of Navigation Congresses.

Chairmen:

Messrs. HELLEPUTTE (Georges), Honorary Engineer of the Ponts et Chaussées. Professor at the University of Louvain. Member of the House of Representatives.

DE ROTE (Leon), Director general of the Ponts et Chaussées.

General Secretary:

Mr. DUFOURNY (Alexis), Chief Engineer. Director of the Ponts et Chaussées.

Treasurer:

Mr. LAMBIN (Albert), Engineer of the Ponts et Chaussées. Secretary to the Ministry of Finance and Public Works.

Members:

Messrs.

Argentine Republic. — DUCLOUT (Georges), Inspector general of the departement of Civils Engineers.

Austria. — RUSS (Dr. Victor), Reichsrats-und Landtags-abgeordneter.

China. — CHEN NGEN TAO, Commander, Naval attaché to the Chinese Embassy, London.

Congo Free State. — WANGERMÉE (Emile), Capitaine commandant de Génie. Vice Governor-general of the Congo Free State.

Danube (European Commission of the). — No member appointed.

Denmark. — OTTERSTROM (Christian), Director of maritime works of the Danish government.

France. — QUINETTE DE ROCHEMONT (Baron), Inspector general of the Ponts et Chaussées. Department of lighthouses and buoys.

Germany. — SCHULTZ (Alfred), Königlich Preussischer Ministerialdirektor, Wirklicher Geheimer Rat;

WITTICH (Franz), Geheimer Regierungsrat, Charlottenburg (Berlin); additional.

Great Britain. — VERNON-HARCOURT (Leveson-Francis), M. A., M. Inst. C. E., London.

Hungary. — No member appointed.

Italy. — ROTA (Chevalier Joseph), Chief Engineer of the Departement of Naval Engineers.

Japan. — ITO YOSHIGORO, Captain, Naval attaché to the Japanese Legation, Paris.

Liberia (Republic of). — STEIN (Baron Adolphe DE), Chargé d'affaires.

Mexico. — SALAZAR (Louis), Engineer.

Monaco (Principality of). — ROBYNS DE SCHNEIDAUER (François), Chargé d'affaires, Consul général.

Netherlands. — CONRAD (J. F. W.), former Inspector general of the Waterstaat, member of the second chamber of the States-general, and of the Koninklijk Instituut van Ingenieurs.

Norway. — SAETREN (Gunnar), Director of the Canal Administration.

Portugal. — MENDES GUERREIRO (Jean Varissimo), Engineer in chief of Public Works. Director of Public Buildings.

Roumania. — No member appointed.

Russia. — DE TIMONOFF (V. E.), Councillor of State, Professor and Secretary of the Council of the Institute of Engineers of Ways of Communication.

DE HOERSCHELMANN (E. F.), Councillor of State, Assistant chief of the department of Ways of Communication. Additional.

Spain. — CHURUCCA (Evariste DE), Chief Engineer of the National corps of Roads, Canals and Bridges, Director of Works of the Port of Bilbao.

Sweden. — BERG (Lars), Director general of the Ponts et Chaussées.

Switserland. — DE MORLOT (Albert), Chief Inspector of Public Works of the Swiss Confederation.

United States. — No member appointed.

The sitting of the Council took place on the date arranged, at the offices of the general Directorate of the Ponts et Chaussées, in Brussels, under the presidency of Messrs. Helleputte and De Rote. Messrs Debeil and Gobert, Belgian members of the Permanent International Commission were present at the sitting, as well as Mr. Sympher, Chief Engineer of Berlin.

It was unanimously agreed, for the absent members had taken care to send letters of agreement that the Council should ratify the suggestions put forwards by the delegates of the German Empire, Messrs. Schultz and Sympher. It approved of the proposal, put forward by these authorities, *that the number of sections should be limited to two at the most.* Hence all questions relating to *inland navigation* would be discussed in one and the same hall, and at the same time those relating to *maritime navigation* in another. Thus members desiring to take part in the discussion of some question or other regarding navigation, would not have the least hesitation as to where to go.

Other innovations were accepted with a view to shortening the debates. Firstly, subjects of little importance shall no longer be brought forward as "Questions", to be the subject of a number of papers and a discussion, but shall instead be accepted only as "Communications" and will usually not give rise to discussion.

Further, instead of the numerous reporters belonging to various countries, who up to now have treated the same question and came forward successively to place their views before the meeting, which made it neccessary, after the discussion, for a *general reporter* to study, compile and draw up a Summary — for which he usually had but a few hours — of the views, frequently very much opposed, of his colleagues, there shall be in future a *reporter general for each question.*

This latter will be informed, in ample time before the beginning of the Congress, of all the reports, notes, and studies sent in on a given question, by the various specialists who have been at work on the subject. By these means, which he will have to group and coordinate, the general reporter will draw up a report which will be published in three languages : he will give, if he

chooses, his own opinion and conclusions, but in any case the Congress will have before it, as regards each question, a number of facts, arguments and opinions, clearly brought forward without any commentaries there on, and whose origin and authors will be in each case carefully indicated; the documents sent in by these latter will be inserted as an annexe and translated if required. In this way the work of the Congress will be greatly simplified.

Summarised, the proceedings of the Congress will be as follows: there will be only two sections, and three questions will be submitted by three general reporters to each section; the work will thus be condensed and summarised in advance, which will greatly facilitate arriving at a definite resolution in as short a space of time as possible.

So as to leave an opening for those who wish to bring before the attention of their colleagues, members of the Congress, or at any rate to inform them of studies which have been carried out from some special point of view, there will be hence forward two classes of questions submitted to the Congress.

The "Questions" properly so called — those which constitute the essential element of the Congress, which form the main cause of its meeting, on which reports are invited and are necessary, and the "possible questions" of slight importance which will be termed "Communications" and as regards which, members are at liberty to submit notes and papers.

These "Communications" will come before the Congress and will be discussed, if time permits, that is to say, if the principal programme has been completed and there is still sufficient time to consider further questions.

The Congress of Dusseldorf shall be organised on the above mentioned rulings, by a Special German Committee.

The meeting then drew up the programme of proceedings for the IXth Congress, the expenses of which will be covered by the Imperial Treasury and the communal funds of Dusseldorf. The date of the meeting was also settled upon, and a provisional programme was drawn up.

INTERNATIONAL

NAVIGATION CONGRESS

IXth Congress

Düsseldorf 1902

PROGRAMME OF THE PROCEEDINGS OF THE CONGRESS

FIRST SECTION

INLAND NAVIGATION

A. — QUESTIONS.

FIRST QUESTION. — **Surmounting of great ascents.**

Discussion of the technical and economic values of the most appropriate methods of surmounting great differences of level with a view to constructing an artificial waterway.

Papers may be sent in treating the question as a whole, or dealing with certain portions of the subject only, more especially with inclined planes, vertical lifts and locks with a great fall. The possibility of constructing tunnels and the necessity for procuring a water-supply may be taken as coming within the scope of the general discussion.

SECOND QUESTION. — **Ship Tolls.**

Discussion from the economic and financial point of view. A critique of the following questions is particularly desirable :

a) *Is it possible by the charging of ship-dues on inland waterways and at inland ports to cover the working expenses and maintenance cost, and to gradually pay off the original installation expense?*

b) *How far has this goal been attempted and attained?*

c) *What circumstances have assisted or prevented the attaining of the desired result?*

d) *How far, and in what cases has the result been obtained owing to the societies working the inland waterway having themselves undertaken:*

1° *The haulage of vessels?*

2° *The entire work of management of the system of navigation, (which system has been at the disposal of the traffic), at a given rate.*

e) *Which of the expenses of construction as regards the installation and improvement of waterways, should not be included in the calculation of the shipping dues, owing to the fact that the sum of this expenditure has not been expended on navigation.*

THIRD QUESTION. — **Depreciation of coal and coke through transport by water.**

Show what are the principal agencies causing depreciation in the value of coal and coke when carried by water, when loaded or unloaded, when stored for a long time; the importance of the amount of damage caused should be estimated, and suggestions made as to means for remedying this state of affairs, such as tipping apparatus, etc. It is also adviseable to take into account the means to be adopted so as to avoid or indirectly diminish these drawbacks, for example, by the consumption of small coal, by the production of coke at the spot where it is to be used instead of at the pit's mouth, etc., and also to determine so far as is possible the depreciation in value of coal and coke when carried by rail.

B. — COMMUNICATIONS.

FIRST COMMUNICATION. — **The installation of reservoir-dams.**

Discussion from an economic and technical point of view of the installation of reservoir-dams, including the Nile dams, the object of which is to allow, by increasing the reserve supply of water, of raising the low-water level of navigable rivers, without going into the question of construction.

SECOND COMMUNICATION. — **Improvements in mechanical haulage on canals.**

THIRD COMMUNICATION. — **River boats with a draught of less than 0.75 m. (about 29 inches. Eng:) of water.**

River boats with a draught of less than 29 inches, and the experience acquired as to the use of turbines and screws for the navigation of shallow rivers, in accordance with the resolution adopted by the VIIIth Congress as regards Question 3.

FOURTH COMMUNICATION. — **Utilisation of hydraulic power available at the weirs of canalized rivers, and in times of flood, for the mechanical (and electrical) haulage of vessels.**

FIFTH COMMUNICATION. — **Recent experiments regarding the tractional resistance of vessels, especially on canals.**

SIXTH COMMUNICATION. — **New ports on the Bavarian Rhine.**

SEVENTH COMMUNICATION. — **The port of Crefeld on the Rhine.**

EIGHTH COMMUNICATION. — **Hydrographic work in Prussia and North-Germany.**

NINTH COMMUNICATION. — **Junctions of inland navigation.**

TENTH COMMUNICATION. — **Dams fitted with rollers.**

ELEVENTH COMMUNICATION. — **Austrian waterways.**

TWELFTH COMMUNICATION. — **The water-supply of Austrian Canals.**

THIRTEENTH COMMUNICATION. — **Electrical installations on Russian waterways and at ports, from an economic and technical point of view.**

FOURTEENTH COMMUNICATION. — **Correction of the course of the « Hunte » below the town of Oldenburg.**

FIFTEENTH COMMUNICATION. — **On the motion of water in a current.**

SIXTEENTH COMMUNICATION. — **On the use of steam-vessels in shallow waters.**

SECOND SECTION

OCEAN NAVIGATION

A. — QUESTIONS.

FIRST QUESTION. — **Costs of construction and maintenance of iron and wooden lock gates.**

Taking into consideration the life, ease of repair, of maintenance, of rigging and of unrigging.

SECOND QUESTION. — **Sea-lighter trade.**

The discussion of the following questions is requested :

a) *What is the extent of the sea-going barge and lighter trade? Treat specially the barge-traffic capable of navigating both on rivers and canals opening on the sea.*

b) *Methods of construction and working most appropriate to sea-going barges, also the expenses and freight-charges pertaining thereto.*

c) *What are the advantages and disadvantages from the point of view of public and economic interest, attaching to sea-going barge traffic.*

d) *Under what circumstances may we expect the greatest advantages from, and what are the economic limits of employment of sea-going lighters, which can also navigate rivers and canals, in competition with inland traffic properly so-called, and the inland and maritime traffic comprising the lighterage system in sea-ports.*

e) *What are the duties of the Government as regards the development of the sea-going barge trade (calculation of dues, etc...?)*

THIRD QUESTION. — **Dock accomodation.**

Construction and working of docks, floating docks and slips for the maintenance and repair of large modern ships. Their practical use and economic convenience.

B. — COMMUNICATIONS.

FIRST COMMUNICATION. — **Dredging of maritime harbours.**

Specially as regards the maintenance of depth of the channel at the entrance of Ostend Harbour.

SECOND COMMUNICATION. — **Protection of lighthouses.**

Protection of lighthouses and other such maritime signals, from the detriment caused to their working by private installations.

A review of actual cases demanding legal protection is desired, as well as of the present legal status of this matter, and of the attempts which have been made up to the present to extend the protection afforded by law.

THIRD COMMUNICATION. — **Method of construction, results obtainable and cost of working of spoon and toothed dredgers.**

FOURTH COMMUNICATION. — **Progress in maritime signalling.**

FIFTH COMMUNICATION. — **Recent experiments on the tractional resistance of vessels in the open sea.**

SIXTH COMMUNICATION. — **Dredging work carried out in the ship canal of St. Petersbourg and its ports.**

SEVENTH COMMUNICATION. — **Ship-canals at the mouths of the Dnieper and Bug rivers.**

EIGHTH COMMUNICATION. — **The « Kaiser Wilhelm » canal. Traffic experiences and results.**

NINTH COMMUNICATION. — **Ports of the western coast of Portugal.**

TENTH COMMUNICATION. — **The construction of a harbour in the bay of Monaco.**

ELEVENTH COMMUNICATION. — **Automatic removal of ocean bars by the application of natural forces.**

NAMES OF THE REPORTERS

AND

TITLES OF THE REPORTS SUBMITTED TO THE IXth CONGRESS

NAMES OF THE GENERAL REPORTERS

First Section. — Inland Navigation.

A. — QUESTIONS.

FIRST QUESTION. — *Surmounting of great ascents.*

1. **Bubendey,** F. — *General report.* — Surmounting of great ascents. (Germany) (G.E.F.)

2. **Genard,** H., and **Denil,** G. — Hydraulic lifts for boats on the Canal du Centre, in Belgium. (Belgium) (F.E.G.)

3. **Lefebvre,** Em. — Deep-fall locks on the Charleroi to Brussels Canal and the arrangements carried out for economising part of the water required for locking the boats. (Belgium) (F.E.G.)

4. **Gerdau,** B. — Surmounting of great ascents. (Germany) (G.E.F.)

N. B. — 1. The reports are given according to the order of their classification in the Report of the proceedings of the IXth Congress, pp. 35 to 43.

2. The name of a country, in brackets, after the title of a report, indicates the nationality of the writer.

3. The letters E., F. and G., in brackets, indicate that the report was published in English (E.), in French (F.) or in German (G.). The first letter in the brackets shows what was the original language in which the report was written.

5. **Offermann,** C. — About ship lifts and their further development. (Germany) (G.E.F.)

6. **Schnapp.** — Lock without water consumption. Schnapp von Gerstenbergk system. (Germany) (G.E.F.)

7. **Barbet,** L. — Surmounting of great ascents. (France) (F.E.G.)

8. **Saner,** J.-A. — Surmounting of great ascents. (Great-Britain) (E.F.G.)

9. **Thomas,** G. C. — The « Thomas » canal-barge lift. (Great-Britain (E.F.G.)

10. **Kuhn,** R. — Surmounting of great ascents in future inland-canal projects of Austria. (Austria) (G.E.F.)

11. **Schönbach,** V. — Surmounting of great ascents. (Austria) (G.E.F.)

12. **Chérassimoff,** N. — A system applicable to movable weirs and lock gates, for large heads of water. (Russia) (G.E.F.)

13. **Laurell,** P. — Surmounting of great ascents. (Sweden) (G.E.F.)

14. **Raymond,** C.-W. — Surmounting of great ascents. (United States) (E.F.G.)

SECOND QUESTION. — *Ship tolls.*

15. **Freiherr von Biegeleben.** — *General report :* Ship tolls. (Germany) (G.E.F.)

16. **Bertrand,** G. N. — Ship tolls. (Belgium) (F.E.G.)

17. **de Schryver,** F. and **Zone,** J. — Report on the results of the haulage of boats by steam tugs, on the Brussels to Rupel canal. (Belgium) (F.E.G.)

18. **Dr. Behrend.** — Ship tolls. Investigations from a financial, and especially from an economic point of view. (Germany) (G.E.F.)

19. **Dr. Heubach,** E. — Ship tolls. (Germany) (G.E.F.)

20. **Peters.** — The financial development of the Prussian inland waterways. (Germany) (G.E.F.)

21. **Charguéraud,** A. — Ship tolls. (France) (F.E.G.)

22. **Hunter,** W.-H. — Ship tolls. (Great-Britain) (E.F.G.)

23. **Déking-Dura,** A. — Ship tolls. (Netherlands) (G.E.F.)

THIRD QUESTION. — *Depreciation of coal and coke through transport by water.*

24. **Zörner.** — *General report.* — Depreciation of coal and coke through transport by water. (Germany) (G.E.F.)

25. **Rischowski.** — Depreciation of coal and coke by shipment. (Germany) (G.E.F.)

26. **Stelkens.** — Depreciation of coal and coke by shipment. (Germany) (G.E.F.)

27. **Gruner,** E. — Depreciation of coal and coke by shipment. (France) (F.E.G.)

B. — COMMUNICATIONS.

FIRST COMMUNICATION. — *The installation of reservoir-dams.*

28. **Thiele,** F., and **Ruprecht,** C. — Installation of reservoir-dams for the obtaining of additional water supply, in order to raise the low-water level of navigable rivers. (Germany) (G.)

SECOND COMMUNICATION. — *Improvements in mechanical haulage on canals.*

29. **Gerard,** L. — The system of electrical haulage. — Determination of the starting and traction torque. (Belgium) (F.)

30. **Abshoff,** F. and **Büsser,** O. — Electricity applied to inland navigation. (Germany) (G.)

31. **Volkman** and **Köttgen,** C. — Mechanical haulage of vessels on canals. (Germany) (G.)

32. **Mollard.** — Electrical haulage on the canals of the north of France. (France) (F.)

THIRD COMMUNICATION. — *River boats with a draught of less than 0.75 m. (about 29 inches. Eng.) of water.*

33. **Iskolski,** D. — The use of turbine screws, and especially of turbine propellers on the Holtz system (German patents n^{os} 85599 and 115486) for shallow-draught boats. (Germany) (G.)

34. **Jahnel,** A. — River boats of a less draught than 0^{m}75 (about 29 inches. Eng:), and notes on the use of turbines for navigation purposes on shallow rivers. (Germany) (G.)

35. **Weiss,** E. — River boats of a less draught than 0^{m}75 (about 29 inches. Eng:), and notes on the use of turbines or screws for navigation purposes on shallow rivers. (Germany) (G.).

36. **Merczyng,** H. — River boats of a less draught than 0^{m}75 (about 29 inches. Eng:) on Russian rivers, and the use of petroleum motors on the Escher-Wyss canal-system for small boats. (Russia) (G.).

FOURTH COMMUNICATION. — *Utilization of hydraulic power available at the weirs of canalized rivers, and in times of flood, for the mechanical (and electrical) haulage of vessels.*

37. **Prüsmann.** — Utilization of hydraulic power available at the weirs of canalized rivers, even in times of flood, for the mechanical (and electrical) haulage of vessels. (Germany) (G.)

38. **Craftio,** H., and **de Karaulow,** N. — Note relating to the scheme drawn up by the road-administration of the district of St. Peterbourg, for the utilisation of the energy obtainable from the Wolchow Rapids, for the haulage of vessels on the Ladoga canal. (Russia) (G.)

FIFTH COMMUNICATION. — *Recent experiments regarding the tractional resistance of vessels, especially on canals.*

39. **Haack,** R., and **Engels,** H. — Recent experiments in the tractional resistance of vessels, especially on canals. (Germany) (G.)

40. **Thiele,** F. — Tractional resistance according to various cross-sections of canals, and importance of the freight-rates which depend there-on. (Germany) (G.)

41. **Rota,** G. — Note on the question of experiments with models in research work regarding the tractional resistance of vessels in use for inland navigation. (Italy) (F.)

42. **Schromm,** A. — Recent experiments on the tractional resistance of vessels. (Austria) (G.)

SIXTH COMMUNICATION. — *New ports on the Bavarian Rhine.*

43. **Rosshirt,** J. — New ports on the Bavarian Rhine (Germany) (G.)

SEVENTH COMMUNICATION. — *The port of Crefeld on the Rhine.*

44. **Hentrich,** H. — The port of Crefeld on the Rhine. A new manufacturing and commercial port on the left bank of the Lower-Rhine. (Germany) (G.)

EIGHTH COMMUNICATION. — *Hydrographic work in Prussia and North-Germany.*

45. **Keller,** H. — Hydrographic work in Prussia and North Germany. (Germany) (G.)

NINTH COMMUNICATION. — *Junctions of inland navigation.*

46. **Wittenberg,** M. — Junctions of inland navigation. (Germany (G.)

TENTH COMMUNICATION. — *Dams fitted with rollers.*

47. **Carstanjen.** — Dams fitted with rollers, and more especially the new dam of Schweinfurt. (Germany) (G.)

ELEVENTH COMMUNICATION. — *Austrian waterways.*

48. **Hillinger,** H. — Austrian waterways. General account of the studies of the hydrotechnical bureau of the Ministry of Commerce. (Austria) (G.)

TWELFTH COMMUNICATION. — *The water-supply of Austrian canals.*

49. **Riedel,** J. — The water-supply of Austrian canals (Austria) (G.)

THIRTEENTH COMMUNICATION. — *Electrical installations on Russian waterways and at ports, from an economic and technical point of view.*

50. **Merczyng,** H. — Electrical installations on Russian waterways and at ports, from an economic and technical point of view. (Russia) (G.)

FOURTEENTH COMMUNICATION. — *Correction of the course of the « Hunte » below the town of Oldenburg.*

51. **Tenge.** — Correction of the course of the Hunte below the town of Oldenburg. (Germany) (G.)

FIFTEENTH COMMUNICATION. — *On the motion of water in a current.*

52. **Greve,** J. — The motion of water in a current according to the different levels between low water and the highest tides.
Graphic representation and curves of the speeds. (Germany) (G.)

SIXTEENTH COMMUNICATION.— *Steam vessels for use in shallow waters.*

53. **Liebrechts,** C. — Steam vessels for use in shallow waters. (Belgium) (F.)

Second Section. — Ocean Navigation.

A. — QUESTIONS.

FIRST QUESTION. — *Costs of construction and maintenance of iron and wooden lock gates.*

54. **Fülscher.** — *General report:* Costs of construction and maintenance of iron and wooden lock gates. (Germany) (G.E.F.)

55. **Pierrot und Mélotte.** — The Kattendyk maritime lock at Antwerp. (Belgium) (F.E.G.)

56. **Brandt** and **Hotopp.** — Costs of construction and maintenance of iron, steel, and wooden gates for lock and dock passages and sluiceways with special reference to their durability and the facility of repairing, reconstructing and maintaining them, as also of erecting and removing them. (Germany) (G.E.F.)

57. **Joly,** M. — Costs of construction and maintenance of iron and wooden lock gates. (France) (F. E. G.)

58. **Hunter,** H. — Lock gates of Greenheart timber and of steel. (Great-Britain) (E. F. G.)

59. **Squire,** W.-W. — Construction and working of lock gates with reference to repairs and maintenance. (Great-Britain) (E.F.G.)

60. **Nelemans,** J. — Costs of construction and maintenance of iron and wooden lock gates. (Netherlands) (G.E.F.)

SECOND QUESTION. — *Sea-lighter trade.*

61. **Hermann.** — *General report:* Sea lighter trade (Germany) (G.E.F.)

62. **Hage,** C.-D. — Sea-going river-boats. (Denmark) (G.E.F.)

63. **Ceck,** F. — Sea-lightertrade. — Sea-lighters on the Dortmund and Ems Canal. (Germany) (G.E.F.)

64. **de Thierry,** G. — Sea lighter trade. (Germany) (G.E.F.)

65. **Cuérard.** — Transport by means of sea-going barges or lighters. The employement of towed lighters for sea transport, in the region of Marseilles. (France) (F.E.G.)

66. **Philippeo,** M. — Lighter trade of the sea of Azov. (Russia) (F.E.G.)

THIRD QUESTION. — *Dock accomodation.*

67. **Franzius,** G. — *General report:* Dock installations. (Germany) (G.E.F.)

68. **Howaldt,** G. —Docks. (Germany) (G.E.F.)

69. **Rudloff,** R. — Docks. (Germany) (G.E.F.)

70. **Luiggi,** L. — Construction and working of graving docks, floating docks, and slipways, for repairing and improving large modern sea-going ships. The large graving-dock of the military port of Bahia-Blanca (Argentine Republic). (Italy) (F.E.G.)

71. **Desprez,** H. — General disposition and working of repairing establishments in the commercial ports of France. (France) (F.E.G.)

72. **Nobel,** C. — Construction and working of the floating docks of the town of **Rotterdam.** (Netherlands) (G.E.F.)

B. — COMMUNICATIONS.

FIRST COMMUNICATION. — *Dredging of maritime harbours.*

73. **Van der Schueren.** — Dredging of maritime harbours for the maintenance of the depth of the entrance channel. — Port of Ostende. (Belgium) (F.)

74. **Lentz,** H. — Artificial dredging of maritime harbours. (Germany) (G.)

SECOND COMMUNICATION. — *Protection of lighthouses.*

75. **Just** and **Suadinani.** — Protection of lighthouses and other such maritime signals against the detriment caused to their working by private installations. (Germany) (G.)

76. **de Joly,** G. — Protection of lighthouses and other such maritime signals against the detriment caused to their working by private installations. (France) (F.)

THIRD COMMUNICATION. — *Methods of construction, results obtainable and cost of working of spoon and toothed dredgers.*

77. **Loewer.** — Method of construction, results obtainable and cost of working of spoon and toothed dredgers (Germany) (G.)

78. **Scholer.** — The suction-dredger « Nicolaus ». (Germany) (G.E.F.)

79. **Truhlsen.** — Construction, capacity and cost of working of toothed dredgers. (Germany) (G.)

80. **Bogart,** J. — Construction, capacity and cost of operating dredging machines of several types in recent excavations of large magnitude. (United States) (E.)

FOURTH COMMUNICATION. — *Progress in maritime signalling.*

81. **Körte,** W. — Progress in methods of maritime signalling. (Germany) (G.)
I. Fog signals.
II. Catadioptric sections of the Fresnel type with curved or broken sides.

FIFTH COMMUNICATION. — *Recent experiments on the tractional resistance of vessels in the open sea.*

82. **Flamm,** O. — Tractional resistance of vessels in the open sea. (Germany) (G.)

83. **Schütte,** J. — Recent experiments on the tractional resistance of vessels in the open sea. (Germany) (G.)

SIXTH COMMUNICATION. — *Dredging work carried out in the ship-canal of St. Petersbourg and its Ports.*

84. **Schiruchin.** — Dredging work carried out in the ship-canal of St. Petersburg and its ports. (Russia) (G.)

SEVENTH COMMUNICATION. — *Ship-canals at the mouths of the Dnieper and Bug rivers.*

85. **de Timonoff,** V.-E. — Ship-canals at the mouths of the Dnieper and Bug rivers. (Russia) (F.)

EIGHTH COMMUNICATION. — *The « Kaiser Wilhelm » Canal. Traffic experiences and results.*

86. **Loewe.** — The « Kaiser Wilhelm » canal. Trials and working results. (Germany) (G.)

NINTH COMMUNICATION. — *Ports of the Western coast of Portugal.*

87. **da Costa,** J.-C. — Ports of the Western coast of Portugal (Portugal) (F.)

TENTH COMMUNICATION. — *Construction of a harbour in the bay of Monaco.*

88. **Batard-Razelière,** A. — Construction of a harbour in the bay of Monaco. (France) (F.)

ELEVENTH COMMUNICATION. — *Automatic removal of ocean bars by the application of natural forces.*

89. **Haupt,** L.-M. — Automatic removal of ocean bars by the application of natural forces. (United States) (E.)

VARIOUS PUBLICATIONS.

90. *The Congress members' guide.* (G.)

Part 1. — Commercial business.

Part 2. — The development of waterways in Prussia.

Part 3. — The town of Düsseldorf.

Part 4. — Excursions into the Rhine district and Westphalia.

Index.

Map of the excursions.

Special guide-book n° 1. for the inspection of the port installations of Dusseldorf.

Special guide-book n^{os} 2 and 3 for the excursions to Ruhrort and Duisburg.

Special guide-book n° 4 for the excursion to Elberfeld.

Special guide-book n° 5 for the excursion to Barmen.

Special guide-book n° 6 for the excursion to the "Siebengebirge" (seven mountains) and to Cologne.

Special guide-book n° 7 for the excursion to Heinrichenburg and Dortmund.

Special guide-book n° 8 for the excursion to the Krupp works at Essen.

Special guide-book n° 9 for the excursion to Remscheid and Müngsten.

Part 5. — Excursion to the Baltic (Kaiser Wilhelm canal) and the Hanseatic towns.

Index.

Special guide-book n° 1, for Bremen and Bremerhaven (1);

Special guide-book n° 2, concerning the course of the Baltic canal;

Special guide-book n° 3, for Kiel and the port of Kiel;

Special guide-book n° 4, for Lübeck and the canal from Elbe to the Trave.

Special guide-book n° 5, for Hambourg and its maritime installations.

91. *Catalogue of the Exhibition.* (G.)

92. *Programmes of the excursions into the Rhine district and Westphalia.* (G.)

B. *Publications printed by other bodies.*

The distribution of the following documents has not always been general.

Germany (publications in the German language):

By the management of the Imperial ship-yards at Kiel.

93. Description of the slip-ways at Kiel.

By the Ministry of Public Works of the Kingdom of Prussia.

94. Works carried out by the Rhine river Commission from 1851 to 1900, by R. Jasmund.

95. The canal from Dortmund to the Ems. Work published in commemoration of the opening of the canal in 1899. Berlin 1899.

---

(1) The Members of the Congress also received at Bremen the following maps :

The free port of Bremen and its extensions.

The River Weser at Bremen up to the « Rothe Sand » lighthouse.

The installations of the port of Bremerhaven.

96. Memoir on the opening of the new maritime harbour at Emden, by C. Schweckendieck. Berlin 1901.

97. The construction of the canal from Dortmund to the Ems (with atlas). Berlin 1902.

98. Various plans of the Institute of Hydrotechnology in course of construction on the "Schleuseninsel" in the Zoological gardens of Berlin.

By the Management of the hydraulic works of the Kingdom of Prussia on the Rhine at Coblentz:

99. The Rhine from an economic and technical point of view, from Strassburg to the frontiers of Holland, by E. Beyerhaus. Coblentz. 1902.

By the Royal Prussian Government at Stettin.

100. Map showing the available building land at Swinemünde.

By the Royal Inspectorate of hydraulic works at Ruhrort:

101. The port of Ruhrort, its development and importance.

By the municipality of Dusseldorf:

102. The town of Dusseldorf and its local authorities in the year of the exhibition of 1902, by Dr. Hans Meydenbauer.

By the municipality of Leer:

103. The extensions of the port of Leer in Eastern Frieseland.

By the municipality of Magdeburg:

104. The installations of the port of Magdeburg. Magdeburg 1898.

105. Tarifs and Regulations of the Administration in charge of the port and goods yards of Magdeburg.

By the Harbour Authorities of the port of Münster in Westphalia:

106. Statistics of the traffic in 1899. 1900 and 1901 of the local port of Münster. Münster. 1902.

By the Associated Canals between Lower Saxony and Hanover:

Collection of publications relating to the question of the canal.

107. The Mittelland canal is not a danger to agriculture, by agricultural councillor Vibrans. Hanover. 1899.

108. Waterways with low rates do not affect the prices of local crops, by commercial councillor W. Kiesekamp. Hanover 1899.

109. Map and longitudinal section of the canal from the Rhine to the Weser and the Elbe, with summary notes, by Fritz Geck, Harbour master. Hanover 1899.

110. The importance of the canal from the Rhine to the Weser and the Elbe, from a military point of view, by major Kurs. Hanover. 1899.

111. Canal A. B. C. — Summary of the recital of causes, and of the addenda, of the proposed law relating to the construction of a canal from the Rhine to the Elbe, by Fritz Geck, Harbour master, Hanover. 1899.

112. The inland navigation of Germany is to the advantage rather than the disadvantage of German agriculture, by Victor Kurs. Hanover. 1899.

113. Canals and their relation to the price of grain, by commercial councillor W. Kiesekamp. Hanover, 1899.

114. The "Mittelland" canal as a base for rural improvements, by Fritz Geck, Harbour master. Hanover 1899.

115. The canal from the Rhine to the Elbe and the defence of the country; extract from the official review "Berliner Korrespondenz". Hanover. 1899.

116. The canal from the Rhine to the Elbe will create a flourishing industry and will favour rural economics and the defence of the country, by a retired Consul, A. B. Schlenking. Hanover. 1899.

117. Note in favour of the proposed law relating to the construction of a canal. Hanover. 1899.

118. The coastwise canal and its annexe; length of the waterways. Hanover 1899.

119. The canal from the Rhine to the Elbe and the railways of the Ruhr district by the late Chairman of the Todt railway. Hanover. 1900.

120. The railway as a carrier of merchandise, by the late Chairman of the Todt railway. Hanover. 1900.

121. Stoppages due to frost on waterways and railways, by Victor Kurz, Major of Engineers. Hanover. 1900.

122. The sufficiency of the water supply of the canal from the Rhine to the Weser and the Elbe, by H. Buttman. Major of Engineers. Hanover. 1900.

123. The want of labour, by Humann. Hanover. 1900.

124. The canal from the Rhine to the Weser and the Elbe, from a financial and economic point of view, by E. Lühning. Royal inspector of hydraulic works. Hanover. 1900.

125. The importance of the arguments raised against the construction of a canal from the Rhine to the Elbe. Hanover 1900.

126. The new proposed law for tne construction of the canal and the Prussian State-railways, by Victor Kurs. Hanover. 1900.

127. The question of freight rates as regards the milling industry by G. Rössmuller. Hanover. 1900.

128. Canal A. B. C. — Data from the proposed laws of 1899 and 1901 relating to the construction of the canal, and other official and non-official documents, by Fritz Geck. Hanover. 1901.

129. Canals in various parts of the world, by E. Abshoff, Engineer. Hanover. 1901.

130. The "Mittelland" canal and its importance, by E. Abshoff, Engineer. Hanover. 1901.

131. The Conservative party and the struggle against the construction of the canal from the Rhine to the Weser and the Elbe, by de Wedelstaedt. Hanover. 1901.

132. The German armies and the French waterways during the war of 1870/71, by Victor Kurs, Major of Engineers. Hanover. 1902.

133. The "Mittelland" canal as a link in the construction of waterways of uniform dimensions in the North-West of Germany, by Humann, Engineer. Hanover. 1902.

134. The Weser, its position in the future system of German waterways, by Victor Kurs, Hanover. 1902.

135. **von Eynern,** Ernst. — Twenty years of strife over the construction of canals. Contribution to the history of the political parties of Germany. Berlin 1901. (G.)

136. **Cröninck,** E. — Berlin and its future installations for a central railway and a central port. Berlin. 1901. (G.)

137. **Havestadt** and **Contag.** — Explanatory text of the exhibits of the firm of Havestadt and Contag. Berlin 1902. (G.)

138. **The Helios Electrical Company** of Cologne. Bremerhaven, "Rhote Sand" (lighthouse), the "Kaiser Wilhelm" canal. (G.)

139. **Lühning,** E. — Management of the inland waterways of Germany and navigation dues. Berlin. 1900. (G.)

Article 54 of the Constitution and the collection of dues on the waterways of Germany. (G.)

The tarif of navigation dues on the inland waterways of Germany. (G.)

140. **Rabitz,** H. — The consolidation of river and canal banks. Berlin. 1901. (G.)

141. **von Studnitz,** Dr. A. — The "Schiff", special number, Berlin. 4 July. 1902. (G.)

142. **Sympher,** L. — Explanations relative to the maps of waterways, published by the author by permission of the Minister of Public works. Berlin. 1902. (G.)

143. **Wattenberg,** Ernst. — Scheme for a lock of 20 meters (75 feet. Eng.) fall. Reprinted from the review "Zeitschrift für Bauwesen", 1902. nos 7 to 9. (G.)

Argentina.

144. **Segovia,** F. and **Corthell,** E.-L. — The rivers Parana, Uruguay and La Plata. Their topography, hydrography and navigability. Berne. 1902. (E.)

Austria.

145. **Klir,** Ant. — The canalisation of the rivers Moldau and Elbe in Bohemia. Prague. 1902. (G.)

146. **Resch,** Sigmund. — The importance and economic future of the town of Cracow as a port and place of loading and unloading, in the system of waterways and canals. Cracow, 1902. (G.)

147. **Urbanitzky,** Rudolf. — Comparative study of the schemes for a canal from the Danube to the Moldau. Lintz. 1902. (G.)

Denmark.

148. **Udall,** E.-P. and **Petersen,** V.-V. — A sea-going river barge. (E.)

Hungary.

149. **Feteke,** Sigismund. — Canals without locks having great differences of level. New systems. Buda-Pesth. 1902. (G.)

Mexico.

150. Port of Tampico. Mexico. 1902. (F.)

151. Improvements in the port of Vera-Cruz. Mexico. 1902. (F.)

152. State of the lighting and buoying of the coasts of the United States of Mexico on the 31st December 1910. Mexico 1902. (Spanish).

---

153. *Report of the proceedings of the IXth Congress.* Berlin 1903. (G.E.F.)

154. *Report of the French delegates on the proceedings of the Congress.* (Extract from the *Annales des Ponts et Chaussées*, 1st and 2nd Quarters, 1903.) (F.)

CONCLUSIONS

ADOPTED BY THE IXth CONGRESS

FIRST SECTION

INLAND NAVIGATION

A. — QUESTIONS.

FIRST QUESTION. — **Surmounting of great ascents.**

CONCLUSIONS ADOPTED :

1. Locks are, after all, the simplest and most durable arrangement for surmounting slopes or inclinations of canals. Spare basins enable a considerable reduction of the amount of water used in working, without, at the same time excessively prolonging the time occupied in locking.

It is desirable that improvements should be devised, in order to reduce the consumption of water.

2. In the case of unusual disparity of heights to be surmounted on short stretches, double locking stairs will be found a suitable means of satisfying the needs of a heavy amount of traffic, the moment a copious supply of water is at disposal. When water is scarce, experience has proved perpendicular lifts to be a valuable arrangement.

3. Inclined planes have, hitherto, been employed for small craft only, although very ingenious proposals have been made for lifting large vessels on inclined planes.

The Congress recommends the laying-out of such an inclined plane and putting it into operation.

SECOND QUESTION. — **Ship Tolls.**

CONCLUSIONS ADOPTED :

1. Navigation tolls on artificial waterways must not be placed at so high a figure as to defeat the aim of such waterways, or to materially impair their usefulness, neutralize the economic functions of navigation, and render a proper division of labour between railway and navigation illusory.

2. In countries, in which it is legally, or in general opinion, acknowledged that, navigation tolls on artificial waterways, shall, at the most, suffice to defray the cost of maintenance and operation, as well as the usual charges for interest and redemption of the capital invested, it follows as a logical consequence that, on fixing the rate of tolls, the indirect profit financially must also be taken into account, resulting from the increase of the tax-paying ability of such waterways and the benefiting of the State finances, which, however, could not be taken into consideration unless political motives compell a greater demand financially upon such waterways.

3. In reply to the questions contained in the official programme, the Congress concludes as follows:

a) A reply to the question, whether, by raising navigation tolls on artificial inland waterways, the expense of maintaining and operating the same can be defrayed, as well as a moderate rate of interest on the capital invested, depends upon a series of circumstances; above all, upon the length and working capacity of the waterway, upon the volume and amount of traffic, upon the rate of railway tarifs, the system of raising and computing tolls as a basis of navigation tariff tolls, and upon the purposes, economic and political, for which the waterway is to be used. Under certain circumstances, it is possible, by the establishment of shipping dues on artificial waterways, to arrive at being able to cover the working and maintenance expenses and to obtain a reasonable interest on the capital invested. To attain this object, frequent efforts have been made both previous to and since the introduction of railways, which aim, during the last half century has been attained in few instances only.

b) Constructional expenses, such as for agriculture, irrigation and drainage, expenses quite foreign to navigation proper, and neither directly nor indirectly promoted by the latter, are to be kept separate from the capital invested in waterways.

THIRD QUESTION. — **Depreciation of coal and coke through transport by water.**

CONCLUSIONS ADOPTED :

For friable coals, liable to depreciate, present arrangements such as barrows, chutes and coal-tips, or combinations of the same, do not tend to prove sufficient so far as quickness in loading and quality are concerned. It would be well, therefore, to request large home and foreign associations, as for instance in Germany, the "Centralverein zur Hebung der Fluss- und Kanalschiffahrt" to arrange a prize competition for solving this problem of depreciation, incidental to loading, or transportation, or to the system of lightering and discharging.

Of course, in this connection, the peculiarities of the various coal districts must be taken into account.

SECOND SECTION

OCEAN NAVIGATION

FIRST QUESTION. — **Costs of construction and maintenance of iron and wooden lock gates.**

CONCLUSIONS ADOPTED :

1. The Congress declares. that no decision is possible about the question, whether in the construction of lock-gates, wood or iron is preferable.

2. This question depends upon technical and financial views and is different in each case.

3. Concerning large-dimensioned gates: gates of iron are to be preferred because the construction can be better carried out with this materiel, because these gates can be moved with greater rapidity and security, and because they can be renewed with greater ease.

SECOND QUESTION. — **Sea-lighter trade.**

CONCLUSIONS ADOPTED:

1. The Congress declares, that the employment of towed sea-lighters in ocean traffic has become of great importance for commerce and ocean travel, bidding fair in the future to assume still greater proportions. It must also be declared, that any and all restriction of such service, by special tolls, for the use of waterways and harbours, must be discountenanced.

2. Respecting dimensions: towed canal and sea-lighters would have to comply with the dimensions of the canals.

It would appear worth while endeavouring to give the waterways conducting directly to the sea, a minimum depth of 3 meters (9 feet, 9 inches, Eng.), and a proportional breadth.

3. Experience hitherto gained in the employment of ocean towage is not able to influence the opinions at present prevailling in respect to the usefullness of inland waterways.

THIRD QUESTION. — **Dock accomodation.**

RESOLUTIONS ADOPTED:

1. In the choice of plans for a proposed ship-repairing establishment the question first arises, whether it is to be laid out as an accessory of a harbour in the general interest of shipping, or whether it is to pay for itself as an independent working institution. In the first case, dry docks are, on account of their simplicity, reliability, and duration of life, almost always to be preferred to all other installations; in the second case, cheaper installations may be more advantageous.

2. For the repair of very large vessels, only dry docks and floating docks to day come into question. Neither of these

kinds of dock has such distinct advantages over the other, that it would be adviseable to use one of them universally. In each case the advantages and disadvantages of both kinds must be carefully weighed, one against the other.

3. The deciding factors in this connection are the following:

a) The required capacity of the dock in regard to speed and certainty in working, and in regard to the variety of work to be performed.

b) The time that can be allowed for construction.

c) The economical conditions. The economy of a dock must in many cases be put into the background in view of the great advantages which such a dock confers on shipping generally.

Note. — A number of papers were sent in, apart from the communications relating to the above questions, but they were not discussed, improvised debates being no longer allowed.

CONSTITUTION

OF THE

Permanent International Association

OF

NAVIGATION CONGRESSES

The Permanent International Association was definitely formed, in 1902, at Dusseldorf, in the course of the meetings of the IXth International Congress.

The members of the Permanent International Commission, which was formed in Paris, in 1900, and most of whom were taking part in the said Congress, were called together on the 2nd July 1902. The meeting was of great interest owing to the number of communications made and the importance of the decisions arrived at. (1).

To commence, Mr. Helleputte, one of the Presidents, after reviewing what had taken place since the Paris Congress, was able to announce, firstly, that the Commission had been completed, and deceased or retiring members had been replaced, secondly, that the Governments which had joined preceding Congresses had been invited by the Belgian Ministry of Foreign Affairs to give pecuniary assistance and to support the new permanent body and that this step had met with complete success. About twenty governments had answered to the invitation, and thanks to their assistance, the question of ways and means which had formerly raised such apprehension, was now most agreably settled.

It was, however, not adviseable to rest content with this result, and, subject, of course, to the approbation of the Commission, steps would be taken to obtain similar results in the

---

(1) The list of the members who took part in the meeting is inserted after the addenda.

cases of governments which had not yet notified their intention to join; and at the same time similar steps would be taken with regard to Societies, Cities, Chambers of Commerce, Shipping Companies, etc. These communications and proposals were warmly greeted.

Besides this, it was now indispensable that the Institution should draw up a charter, a fundamental set of rules and regulations. With this view, a scheme of proposed rules and regulations had been drawn up and sent to each of the members of the Commission. After discussion, the regulations were adopted, each one being considered separately, at the sitting of the 2nd July 1902 (1).

In accordance with these regulations, the "Permanent International Association of Navigation Congresses", was formed, whose management was placed in the hands of the *Permanent International Commission.* From among the members of the Commission was formed a *Permanent Council*, of which the two Chairmen (Messrs. Helleputte and De Rote) and the General Secretary (Mr. Dufourny) formed an *Executive Committee.* The scheme of management of the Association was thus settled in all its details; it could already reckon on ample means of existence; and the future of the Navigation Congresses was thus assured.

In accordance with the Regulations drawn up in 1902, (2), the Association is composed of:

1. The delegates of Governments and Societies who subscribe annually to the Association;

2. Personal members, whose may be either Permanent or Temporary.

3. Honorary members, appointed by the International Commission.

---

(1) The regulations are reprinted at the end of the volume. — The wording decided upon in 1902, has been slightly altered by the International Commission, to bring it more into line with the actual position of the Association.

(2) Since this date, Association now also includes a number of « life members ».

Permanent members shall, in future, alone have the right to vote at meetings of the Congress and the right to submit questions to be discussed at the meetings.

The members shall receive, in whichever of the three languages of the Congress they may select (German, French or English), a copy of each of the publications of the Congress.

The Permanent Commission shall call meetings of the Congress at intervals of, as nearly as possible, three years, in one or other of the States which are officially members of the Congress, and the subjects for discussion shall be presented either as "Questions" or "Communications".

The Congress shall consist of:

Two Sections, one relating to inland navigation and one to navigation on the open sea. These two Sections may be subdivided.

The Permanent Commission shall select, with regard to each «Question» which is to be submitted to discussion, a *general reporter* who will be charged with the duty of preparing and submitting to the Congress a summary of the main points of the Question, in addition to an analysis of the documents received on the subject prior to the meeting. The "Communications" will not be discussed, except in cases when the discussion of the "Questions" is completed, and time is available.

At the meeting of the 2nd July, 1902, the question of the meeting place and date of holding the next Congress was discussed. As to the second point, the meeting was of opinion that it was unnecessary to call a meeting before 1905. On the first point, after having noted the proposal of Messrs Raymond and Corthell that the next meeting should be held in the United States, the Commission adjourned its decision to its next meeting (1).

---

(1) The full report of the meeting of the 2nd July, 1902, is inserted in the report of the proceedings of the IXth Congress (pp. 589-602).

ADDENDA

Meeting of the International Commission held at Dusseldorf, on the 2th July 1902.

LIST OF MEMBERS PRESENT

Chairmen of the Executive Committee:

Messrs HELLEPUTTE, Georges, Ingénieur honoraire des Ponts et Chaussées. Professeur à l'Université de Louvain, Membre de la Chambre des Représentants, Kessel-Loo (Belgium).

DE ROTE, Léon, Directeur général des Ponts et Chaussées, Brussels.

General Secretary:

Mr. DUFOURNY, Alexis, Ingénieur en Chef, Directeur des Ponts et Chaussées, Brussels.

Members of the International Commission:

Austria: M. le Dr. RUSS, Victor, Präsident der oesterreichischen Nordwest-Dampfschiffahrts-Gesellschaft, Mitglied des k. k. Staatseisenbahnrates und des Beirates für Wasserstrassen, Vienna.

Belgium: Messrs DEBEIL, Alphonse, Inspecteur général des Ponts et Chaussées, Brussels.

GOBERT, Auguste, Ingénieur honoraire des Mines, Brussels.

LAMBIN, Albert, Ingénieur des Ponts et Chaussées, Secrétaire du Cabinet du Ministère des Finances et des Travaux Publics, Brussels.

France: Baron QUINETTE DE ROCHEMONT, Emile, Inspecteur général des Ponts et Chaussées, Directeur du Service des Phares et Balises, Paris;

DE MAS, Fernand, Inspecteur général des Ponts et Chaussées, Professeur à l'Ecole Nationale des Ponts et Chaussées, Paris.

Germany: Messrs SCHULTZ, Alfred, Excellenz, Königlich Preussischer Ministerialdirektor, Wirklicher Geheimer Rat, Berlin.

Dr. Ing. FRANZIUS, Ludwig, Oberbaudirektor, Bremen.

WITTICH, Franz, Geheimer Regierungsrat, Berlin.

SYMPHER, Leo, Geheimer Baurat, Berlin.

Great Britain: Mr. VERNON-HARCOURT, Leveson Francis, M. A., M. Inst. C. E., London.

Holland: Mr. CONRAD, J.-F.-W., Ehemaliger Generalinspektor für Wasserbau, Mitglied der zweiten Kammer der Generalstaaten, The Hague.

Russia: His Excellency V. E., DE TIMONOFF, Professeur à l'Institut des Ingénieurs des Voies de Communication, Directeur des Voies de Communication de l'arrondissement de Saint-Pétersbourg, Saint-Pétersburg.

United States: Messrs RAYMOND, Charles Walker, Lieutenant Colonel, Corps of Engineers, U. S. Army, New-York;

CORTHELL, Elmer, Lawrence, Civil Engineer, Buenos-Ayres.

INTERNATIONAL

NAVIGATION CONGRESS

Xth Congress

Milan 1905

PROGRAMME OF THE PROCEEDINGS OF THE CONGRESS

FIRST SECTION

INLAND NAVIGATION

A. — QUESTIONS.

FIRST QUESTION. — **On the advantages and organization of mixed transports, that is by railways and waterways.**

SECOND QUESTION. — **Influence of deforestation and of the drying up of marshes on the sphere of influence and on the performance of rivers.**

THIRD QUESTION. — **Investigation of the methods best suited for surmounting great differences of level between the reaches of canals.**

FOURTH QUESTION. — **Development of inland navigation by means of shallow-draught vessels. Mode of construction of these, and their motor.**

B. — COMMUNICATIONS.

FIRST COMMUNICATION. — **A Study of the means of establishing connection, by inland waterway across the Alps, between the Mediterranean, the Adriatic and Central Europe.**

SECOND COMMUNICATION. — **Economical and technical study of the mechanical traction of boats on rivers, canals and lakes.**

THIRD COMMUNICATION. — **The mortgaging of inland shipping.**

FOURTH COMMUNICATION. — **Have the rivers flowing southward from the Alps the characteristics, and are their hydraulic conditions such, as to render possible the institution of movable dams like those in use on northern rivers, to prevent the fall of the water level with the ebbing tide, and to provide the necessary anchoring ground for shipping.**

FIFTH COMMUNICATION. — **Study of the effects produced by the cutting of navigable canals on underground water systems.**

SIXTH COMMUNICATION. — **Results obtained by dredging in increasing the depth of water of rivers. Technical and administrative organization of works undertaken with this object.**

SECOND SECTION

OCEAN NAVIGATION

A. — QUESTIONS.

FIRST QUESTION. — **Improvement of the mouths of rivers discharging into tideless seas.**

SECOND QUESTION. — **Progress in methods of propulsion of vessels. Effect of these on channels and harbours.**

THIRD QUESTION. — **Review of the various methods of working and administration of seaports. Their influence on the development of trade.**

FOURTH QUESTION. — **Conditions affecting the force of waves and the construction of breakwaters to resist them.**

B. — COMMUNICATIONS.

FIRST COMMUNICATION. — **Rapid increase in the dimensions of steamers and sailing vessels. Their draught of water. Effects of the increase on the harbours, canals and approaches.**

SECOND COMMUNICATION. — **The use of liquid fuel for purposes of navigation.**

THIRD COMMUNICATION. — **The transport of cargo by ferry-boats.**

FOURTH COMMUNICATION. — **Report on the most recent works carried out in the principal seaports.**

FIFTH COMMUNICATION. — **Responsibility of ship owners in regard to private parties or public administrations.**

SIXTH COMMUNICATION. — **Coast signals. — Lightships. — Wireless telegraphy.**

SEVENTH COMMUNICATION. — **Measures adopted by the different governments for the protection of ocean navigation. Bounties. Reduced railway tariffs for merchandise intented to be transported by sea.**

NAMES OF THE REPORTERS

AND

TITLES OF THE REPORTS SUBMITTED TO THE Xth CONGRESS

NAMES OF THE GENERAL REPORTERS

First Section. — Inland Navigation.

A. — QUESTIONS.

FIRST QUESTION. — *On the advantages and organization of mixed transports that is by railways and waterways.*

1. **Moschini,** A. — *General Report.* (Italy) (F.E.G.)

2. **Whinery,** S. — A review of transportation and the relation of transportation agencies to each other in the United States. (United States) (E.F.G.)

3. **Captier,** G. — On the advantages and organization of mixed transportation, that is by railways and waterways. (France) (F.E.G.)

4. **Tavernier,** R. — On the utility and organization of mixed transportation in the South East of France. (France) (F.E.G.)

5. **Crotti,** G., and **Carissimo,** M. — Aerial cableways as applied to the transport service of harbours. (Italy) (F.E.G.)

N. B. — 1. The name of a country in brackets following the title of a report, indicates the nationality of the writer.

2. The letters E, F or G, in brackets, indicate whether the report was published in English (E.), in French (F.) or German (G.). The first letter in the bracket indicates the language in which the original report was written.

6. **Maximoff,** S. — Advantages and organization of mixed transports. (Russia) (F.E.G.)

SECOND QUESTION. — *Influence of deforestation and of the drying up of marshes on the sphere of influence and on the performance of rivers.*

7. **Cipolletti,** C. — *General Report.* (Italy) (F.E.G.)

8. **Keller,** H. — Effect of deforestation and draining of marshes upon the regimen and discharge of rivers. (Germany) (G.E.F.)

9. **Lauda,** E. — Influence of the destruction of forests and the drainage of marshes on the course and regimen of rivers. (Austria) (G.E.F.)

10. **Riedel, J. — Influence of the destruction of forests and of** the draining of swamps on the conditions of flow and level of the rivers. (Austria) (G.E.F.)

11. **Wolfschütz,** J. — Influence of the destruction of forests and of the draining of swamps upon the course and the regimen of rivers. (Austria) (G.E.F.)

12. **Lafosse,** H. — Influence of the destruction of forests and drainage of marshes. (France) (F.E.G.)

13. **Ponti,** M. — Influence of the destruction of forests and drainage of marshes on the regimen and discharge of rivers. (Russia) (F.E.G.)

14. **Lokhtine,** M. — Influence of the destruction of forests and drainage of marshes on the regimen and discharge of rivers. (Russia) (F.G.E.)

THIRD QUESTION. — *Investigation of the methods best suited for surmounting great differences of level between the reaches of canals.*

15. **Crugnola,** G. — *General Report.* (Italy) (F.E.G.)

16. **Gerdau,** B. — Study of systems for overcoming differences of level in canals. (Germany) (G.E.F.)

17. **Hermann,** A., and **Prüsmann,** A. — Systems which are suitable for surmounting great differences in the levels of two canal reaches. (Germany) (G.E.F.)

18. **Vernon-Harcourt,** L.-F. — Investigation of the methods best suited for surmounting great differences of level between the reaches of canals. (Great Britain) (E.F.G.)

19. **Schromm,** A. — A study of the various methods of surmounting differences of level of canal reaches. (Austria) (G.E.F.)

20. **Smrcek,** A. — Comparison of various systems of lifting boats, in respect of their working capacities and their importance as regards the proposed Danube-Oder canal in Austria. (Austria) (G.E.F.)

21. **Genard,** H. — Study of the systems suited to overcoming high lifts between canal levels. Vertical lifts or inclined planes. (Belgium) (F.E.G.)

22. **Lefebvre,** E. — Study of systems suited to overcoming high lifts between canal levels. (Belgium) (F.E.G.)

23. **Symons,** Th. — Mechanical lift locks in America. (United States) **(E.F.G.)**

24. **de Bovet,** A. — On the systems best suited to surmounting great differences of level between the reaches of canals. (France) **(F.E.G.)**

25. **Cirola,** M. — On great differences of level from the point of view of mixed traffic. (Italy) (F.E.G.)

26. **Wouter Cool** and **van Panhuys.** — Means for overcoming great differences of level. (Netherlands) (F.E.G.)

FOURTH QUESTION. — *Development of inland navigation by means of shallow-draught vessels. Mode of construction of these and their motor.*

27. **Fumanti,** J. — *General Report.* (Italy) (F.E.G.)

28. **Blümcke,** R. — Development of the navigation carried on by vessels of shallow draught. Build and means of propulsion of these. (Germany) (G.E.F.)

29. **Wahl,** A. — Development of inland navigation by means of light-draught boats. Mode of construction and motors. (France) (F.E.G.)

B. — COMMUNICATIONS.

FIRST COMMUNICATION. — *A Study of means of establishing connection, by inland waterway across the Alps, between the Mediterranean, the Adriatic and Central Europe.*

30. **Paladini**, E. — *General Report.* (Italy) (F.E.G.)

31. **Riedel,** J. — An enquiry into the feasibility of constructing a navigable waterway through the Alps, to connect the Adriatic Sea and the Mediterranean with Central Europe. (Austria) (G.E.F.)

SECOND COMMUNICATION. — *Economical and technical study of the mechanical traction of boats on rivers, canals and lakes.*

32. **Paladini,** E. — *General Report.* (Italy) (F.E.G.)

33. **Köttgen,** E. — The electrical towage of vessels. (Germany) (G.E.F.)

34. **Thiele,** F. — Economic study of the mechanical ship train on rivers, lakes and canals. (Germany) (G.E.F.)

35. **Thwaite,** B. — An economical and technical study of the mechanical traction of boats on rivers, canals and lakes. (Great Britain) (E.G.F.)

36. **Snyers,** R. — Study of a new mode of mechanical and economical traction for boats. (Belgium) (F.E.G.)

37. **Clarke**, St-J., and **Gerard,** L. — Economical and technical study of the mechanical traction of boats on rivers, canals and lakes, by American methods. (United States) (F.E.G.)

38. **La Rivière,** G. — Economical and technical study of the mechanical traction of boats on rivers and canals. (France) (F.E.G.)

39. **Merczyng,** H. — Mechanical traction of boats proposed in Russia on the canals passing around lake Ladoga. (Russia) (F.E.G.)

THIRD COMMUNICATION. — *The mortgaging of inland shipping.*

40. **Berlingieri,** Fr. — *General Report.* (Italy) (F.E.G.)

41. **Kisker,** W. — The mortgaging of inland shipping. (Germany) (G.E.F.)

42. **de Sanctis,** P.E. — Mortgaging of vessels engaged in internal navigation. (Italy) (F.E.G.)

43. **Frola,** M. — Mortgages on vessels used for inland navigation. (Italy) (F.E.G.)

FOURTH COMMUNICATION. — *Have the rivers flowing southward from the Alps the characteristics, and are their hydraulic conditions such, as to render possible the institution of movable dams like those in use on northern rivers, to prevent the fall of the water level with the ebbing tide, and to provide the necessary anchoring ground for shipping.*

No paper was sent in on this subject.

FIFTH COMMUNICATION. — *Study of the effects produced by the cutting of navigable canals on underground water systems.*

44. **de Sanctis,** P.-E. — *General Report.* (Italy) (F.E.G.)

45. **Denil,** G. — Influence of canals on the domain of the underground waters. (Belgium) (F.E.G.)

SIXTH COMMUNICATION. — *Results obtained by dredging in increasing the depth of water of rivers. Technical and administrative organization of works undertaken with this object.*

46. **Tornani,** J. — *General Report.* (Italy) (F.E.G.)

47. **Roloff,** E. — Effect of dredging on river beds. Technical and administrative management of the operations performed for this purpose. (Germany) (G.E.F.)

48. **Kretz,** F. — Effects produced on the beds of rivers by work done with Kretz dredgers. Technical and administrative management of such like operations. (Germany) (G.E.F.)

49. **Ockerson,** J.-A. — Hydraulic dredges as used for the improvement of navigation on the Mississippi river. (United States) (E.F.G.)

50. **Sassi,** E. — Dredging in the bed of rivers. Tests made in Italy in 1904. (Italy) (F.E.G.)

51. **Kleiber, C.** — Results obtained by dredging the shoals in the Volga between Kstovo and Bogorodsk. (Russia) (F.E.G.)

52. **de Lélavski,** N. — On the deepening of the channels of large rivers with shifting beds by means of regulating the direction of flow, and simultaneous dredging (posthumous work) (F.)

Second Section. — Ocean Navigation.

A. — QUESTIONS.

First Question. — *Improvement of the mouths of rivers discharging into tideless seas.*

53. **Turazza,** G. — *General Report.* (Italy) (F.E.G.)

54. **Germelmann,** W. — Amelioration of the estuaries of rivers flowing into tideless seas. (Germany) (G.E.F.)

55. **Guérard,** A. — Improvement of the mouths of rivers emptying into tideless seas. Works built and observations made at the mouths of the Rhône. (France) (F.E.G.)

56. **Barcelloni,** A. — Protection works at the mouth of the Pô. (Italy) (F.E.G.)

57. **Bruno,** G. — Notice on the arrangement of the mouths of rivers flowing into tideless seas, and on the mouths of the river Pô. (Italy) (F.E.G.)

58. **Orlando,** P. — Experiments on a working model, in order to determine the possibility of improving the mouths of the Tiber for the purpose of maritime navigation. (Italy) (F.E.G.)

59. **Tchekhovitch,** P. — Works of improvement at the mouths of the Kelia arm (Russian branch of the Danube). (Russia) (F.E.G.)

60. **de Timonoff,** V.-E. — Improvement of the mouths of large rivers flowing into tideless seas. (Russia) (F.E.G.)

SECOND QUESTION. — *Progress in methods of propulsion of vessels. Effect of these on channels and harbours.*

61. **Soliani,** N. — *General Report.* (Italy) (F.E.G.)

62. **Techel,** M., and **Narten,** G. — Progress in means for the propulsion of vessels. Consequences in regard to channels and harbours. (Germany) (G.E.F.)

63. **Parsons,** Ch. A. Hon. — Parson's Marine Steam Turbine. (Great-Britain) (E.F.G.)

64. **See,** H. — Some stern facts. (United States) (E.F.G.)

65. **Lelong,** M. — Progress in the means of propulsion for ships. Its effect upon harbours and channels. (France) (F.E.G.)

66. **Rota,** G. — Advance in the means for propelling ships. (Italy) (F.E.G.)

67. **Pecoraro,** N. — Experimental researches on the action of propellers working under special conditions. (Italy) (F.E.G.)

THIRD QUESTION. — *Review of the various methods of working and administration of seaports. Their influence on the development of trade.*

68. **Mazza,** A. — *General Report.* (Italy) (F.E.G.)

69. **Benduhn.** — Exposition of the different methods of working and of management of maritime harbours. Their influence on the development of traffic. (Germany) (G.E.F.)

70. **Winter,** P. — The seaport of Hamburg. Its management and working. (Germany) (G.E.F.)

71. **Joly,** P. — Account of the various methods of administering and operating commercial ports. (France) (F.E.G.)

72. **Lampugnani,** L. — Different systems of administration and operation for ports. Influence of these systems on the economic results of the management of seaports and on the commercial operations of the latter, from the point of view of Italian legislation, as it concerns the autonomy of the port of Genoa. (Italy) (F.E.G.)

73. **Cullini,** H. — Working of the port of Venice. (Italy) (F.E.G.)

FOURTH QUESTION. — *Conditions affecting the force of waves and the construction of breakwaters to resist them.*

74. **Lo Catto,** D. — *General Report.* (Italy) (F.E.G.)

75. **Anderson,** M. — The construction of the outer moles of ports with regard to the wave forces which they are to resist. Estimation of these forces. (Germany) (G.E.F.)

76. **Vernon-Harcourt,** L.-F. — Conditions affecting the force of waves and the construction of breakwaters to resist them. (Great-Britain) (E.F.G.)

77. **Cay,** D.-W. — Construction of outer breakwaters of harbours in view of the force of the waves which they have to resist. Estimate of this power. (Great-Britain) (E.F.G.)

78. **Bech,** C. — Moles near Vorüpor and Hanstholm on the west coast of Jutland, Denmark. (Denmark) (G.E.F.)

79. **de Joly,** G. — Construction of breakwaters outside seaports, taking into consideration the force of the waves they must oppose. Determination of this force. (France) (F.E.G.)

80. **Coen Cagli, E.** — Works of defence of the port of Naples. Considerations on the structure and the shape of breakwaters outside of ports. (Italy) (F.E.G.)

81. **Bastiani,** F., **D'Urso,** F., and **Simoncini,** E. — Structure and form of breakwaters built in Italian harbours. (Italy) (F.E.G.)

82. **Bernardini,** O. — Construction of the outer moles of ports, having regard to the force of the waves which they have to resist. Estimation of this force. (Italy) (F.E.G.)

B. — COMMUNICATIONS.

FIRST COMMUNICATION. — *Rapid increase in the dimensions of steamers and sailing vessels. Their draught of water. Effects of the increase on the harbours, canals and approaches.*

83. **Jorini,** A. — *General Report.* (Italy) (F.E.G.)

84. **Corthell,** E. — Maritime commerce. Development in dimensions of vessels. Existing and proposed dimensions of ports. (United States) (E.G.F.)

85. **Vétillart,** Fr. — Dimensions of ships. Their rapid progression and its consequences. (France) (F.E.G.)

86. **Verdinois,** C. — The rapid increase in the size of steamships and sailing vessels. Its effect upon ports. (Italy) (F.E.G.)

SECOND COMMUNICATION. — *The use of liquid fuel for purposes of navigation.*

87. **Ancona,** U. — *General Report.* (Italy) (F.E.G.)

88. **Melville,** G. — Liquid fuel for naval and marine uses. (United States) (E.F.G.)

THIRD COMMUNICATION. — *The transport of cargo by ferry-boats.*

89. **de Vito,** E. — *General Report.* (Italy) (F.D.E.)

90 **Ashley,** H.-W. — Concerning car-ferries navigating bays, sounds and lakes subject to the jurisdiction of the United States. (United States) (E.G.F.)

91. **Cucchini,** E. — Transportation of freight by ferry boats. (Italy) (F.E.G.)

92. **Rota,** G. — Goods transport by railway ferries. (Italy) (F.E.G.)

FOURTH COMMUNICATION. — *Report on the most recent works carried out in the principal seaports.*

93. **Bubendey,** J., and **Schultze,** L. — The German maritime harbours : Emden, Bremen, Harburg, Hamburg, Lübeck, and Stettin. (Germany) (G.E.F.)

94. **Vander Schueren,** F. — The maritime installations of the port of Ostend. Extension works. (Belgium) (F.E.G.)

95. **Nyssens-Hart,** J., and **Piens,** C. — Account of the construction works at the Zeebrugge landing place. (Belgium) (F.E.G.)

96. **Grenier,** L., and **Van Haute**, G. — Maritime canal from Ghent to Terneuzen and the port of Ghent. (Belgium) (F.E.G.)

97. **Hodgdon,** W. — A description of some of the most recent works executed, and in progress, at the port of Boston, Massachusetts, U. S. A. (United States) (E.F.G.)

98. **Sullivan,** J. — Advanced methods of handling heavy commodities, as exhibited in ports of the Great Lakes. System of North America. (United States) (E.F.G.)

99. **Quinette de Rochemont** (Baron). — Report on the works most recently carried out in the principal maritime harbours of France. (France) (E.F.G.)

100. **Bernardini,** O. — New harbour works at Genoa and Savona. (Italy) (F.E.G.)

101. **Cucchini,** E. — The grain elevator at Venice. (Italy) (F.E.G.)

102. **Cucchini,** E. — The Lido entrance at Venice. (Italy) (F.E.G.)

103. **Perilli,** M. — Jetties of armored concrete. (Italy) (F.E.G.)

104. **Caizzi,** L. — Technical notice of the docks and of the port of Naples. (Italy) (F.E.G.)

105. **Rojdestvensky**, A. — New work carried on in the maritime canal at Saint-Pétersbourg. (Russia) (F.E.G.)

FIFTH COMMUNICATION. — *Responsibility of ship owners in regard to private parties or public administrations.*

106. **Berlingieri,** F. — *General Report.* (Italy) (F.E.G.)

107. **Charguéraud,** A. — Responsibility of ship owners in regard to private parties or public administrations. (France) (F.E.G.)

108. **Verneaux,** R. — Responsibility of ship owners toward private parties or public administrations. (France) (F.E.G.)

SIXTH COMMUNICATION. — *Coast signals. — Lightships. — Wireless telegraphy.*

109. **Pullino**, V. — *General Report.* (Italy) (F.E.G.)

110. **Körte,** W. — Beacons and fog signals on the Prussian coasts. (Germany) (G.E.F.)

111. **Douglass,** W. — Lighthouse engineering in Great Britain. (Great-Britain) (E.F.G.)

112. **Riblère,** C. — Signals and lightships on the coasts of France. (France) (F.E.G.)

113. **Cattolica,** P. — Lighthouses and signals from the standpoint of nautical requirements. (Italy) (F.E.G.)

SEVENTH COMMUNICATION. — *Measures adopted by the different governments for the protection of ocean navigation. Bounties. Reduced railway tariffs for merchandise intended to be transported by sea.*

114. **Soliani,** N. — *General Report.* (Italy) (F.E.G.)

115. **Rösing,** J. — Measures taken by the different governments for the encouragement of navigation. Premiums and reduced railway charges for goods that are to be transported by sea. (Germany) (G.E.F.)

116. **Bates,** W.-W. — Measures adopted by the different governments for the protection of ocean navigation. (United States) (E.F.G.)

117. **Colson,** C. — Measures taken by the government for protecting maritime navigation in France. (France) (F.E.G.)

118. **Bernardi,** J. — Measures taken by the Italian Government for assisting the merchant navy. (Italy) (F.E.G.)

VARIOUS PUBLICATIONS.

119. *Guide to the Milan Congress.* (F.E.G.)

120. Milan in 1905. (I.)

Note. — The letter I. in brackets after the title of a report indicates that the latter was printed in Italian.

121. **Bormann,** A. — The latest types of bucket dredgers constructed in Russia. (1st section). (Russia) (F.)

122. **Sassi,** E. — The laws and regulations in force in Italy with regard to rivers and navigable torrents. (1st section). (Italy) (F.I.)

123. **Havestadt** and **Contag.** — Note by the management of the works on the Teltow canal at the Machnow lock. (1st section). (Germany) (G.)

124. **Havestadt** and **Contag.** — Notes by the management of the works on the Tetlow canal on the electrical traction of vessels, and on the electrical haulage system of the Teltow canal (1st section). (Germany) (G.)

125. **Ministery of Marine.** — Historical notice on the ports of antiquity of the Italian peninsula. (I.)

126. **Coen-Cagli** and **Bernardini,** O. — Maritime ports of Italy. Illustrated report. (Italy) (F.I.)

127. **Cozza,** L., and **Crillo della Berta,** J. — Lakes rivers and navigable canals of the Kingdom of Italy. Illustrations. (Italy) (F.I.)

128. **Pokorny,** F. — Lift for barges and ships (Pokorny system). (F.)

129. **Wilhelm,** M. — International competition at Vienna for a scheme of a lift for ships. Report. (F.)

130. **Orlando,** P. — Rome as a sea port. (Italy) (I.)

131. **Orlando**, P. — Rome as a seaport, and inland navigation on the Tiber and the Nera. (Italy) (I.)

132. **Berni,** A. — River navigation in the province of Mantua in the year 1904. (Italy) (I.)

133. **Cipoletti.** — Regulation of the flow of the Tiber. (Italy) (I.)

134. **Scotti,** A. — Hydraulic power for use in connection with large vessels, and the hydraulic plant at Turbigo. (Italy) (I.)

135. **Prüsmann.** — Comparison between the uses of locks and mechanical lifts. (Germany) (G.)

136. **Schultz,** H. and **Wulle,** K. — The port of Harbourg, and its extension, now in course of construction. (Germany) (G.)

137. **Sympher,** L. — The new laws relating to the waterways of Prussia. (Germany) (G.)

138. **Umlauf,** A., **von Stockert,** L., and **Offerman,** C. — Proposed design for a lift at Prerau. (Austria) (G.)

139. **Umlauf,** A., and **von Stockert,** L. — Which of the two prize designs for a lift should be carried out? (Austria) (G.)

140. **Boet,** G. — Maritime signals. (Italy) (I.)

141. **Czarnomski,** W. — The use of revolving screws as a means of studying the conditions of flow of a stream, and their use in the solution of hydrotechnic problems. (Russia) (F.)

142. **Selfert,** R. — The application of the results of the tests made by revolving screws to the measurement of streams. (Germany) (G.)

143. **Inglese,** I. — A new system of breakwater construction. (Italy) (I.)

144. **Doneaud,** E. — Porto Maurizio in the past, and present, and its mission as a new means of penetration into the interior. (Italy) (I.)

146. **Migliardi.** — Scheme for a vertical lift for ships, worked by cables. (Italy) (I.)

146. **Bonaeira.** — Scheme for timbering a submarine gallery.

147. **Zdenko.** — The fish propeller. (E.)

148. **Association for the inland navigation of the Padana valley.** — Memorandum presented to the International Navigation Congress. (Italy) (I.)

149. **Zeitschrift für Binnen-Schiffahrt.** — Commemorative issue on the occasion of the 10th International Congress of Navigation at Milan. (G.)

150. *Annals of the Public works of Belgium. Report on the Xth Congress.* Brussels. 1905. (F.)

151. *Report of the proceedings of the Xth Congress.* Milan. 1906. (F.E.G.) (1)

152. Report of the French delegates on the proceedings of the Congress. (Extract from the *Annals of the Ponts et Chaussées.* 4th quarter, 1906, and vols 1 and 2. 1907) (F.)

---

(1) The local organising committee published a report of the proceedings of the Xth Congress in italian.

CONCLUSIONS

ADOPTED BY THE Xth CONGRESS

FIRST SECTION

INLAND NAVIGATION

A. — QUESTIONS.

First Question. — **On the advantages and organisation of mixed transports, that is by railways and waterways.**

CONCLUSIONS ADOPTED:

The points of contact between railways and navigable highways should be multiplied as much as possible, by technical and administrative means, and by the assistance of tariff rates, suited more and more to develop mixed transportation.

Second Question. — **Influence of deforestation and of the drying up of marshes on the sphere of influence and on the performance of the rivers.**

CONCLUSIONS ADOPTED:

The influence of the drainage of marshes on the regimen of rivers may, as a rule, be nearly neglected, and, in the matter of the influence of the destruction of forests limiting its conclusions to what may directly interest navigation, the Congress resolves:

1. That States which have not yet done so, regulate, by clear and severe laws, the arrangements relative to the maintenance of existing forests, to the consolidating of mountain land and to the rewooding of cleared surfaces, in order to avoid the damage done to navigable waterways by the materials carried into them.

2. That the hydrologic studies necessary to determine the influence of forests on the regimen of navigable streams be developed systematically and the results made known by the greatest publicity.

THIRD QUESTION. — **Investigation of the methods best suited for surmounting great differences of level between the reaches of canals.**

CONCLUSIONS ADOPTED :

1. Ordinary locks remain the simplest and strongest engines for overcoming differences of level in canals. Storage basins allow their consumption of water to be greatly reduced without too great an increase in the duration of the lockages.

Studies and trials, having for their object a further diminution of this duration and consumption, should be encouraged.

If the water supply is lacking, vertical lifts give a solution which has the sanction of experience.

2. The Vienna competition gave birth to a large number of very interesting conceptions. The Congress attaches the greatest importance to there being made thereof, on a large scale, an application which will allow experience, the sole final judge, to pronounce upon their relative practical values, taking into consideration the speed of the boats, the traffic capacity of the canals, as well as the safety, regularity and economy of the service.

FOURTH QUESTION. — **Development of inland navigation by means of shallow-draught vessels. Mode of construction of these, and their motor.**

CONCLUSIONS ADOPTED :

The Congress, considering the remarkable works published by the Association on the form and traction of boats running on lines of inland navigation, and the prime importance of the question attaching thereto, resolves that the next Congress insert in its order of business as a question ; the mechanical traction of boats, and secondarily the study of the forms of and the utilization of light draft boats.

B. — COMMUNICATIONS. (1)

FIRST COMMUNICATION. — **A Study of the means of establishing connection, by inland waterway across the Alps between the Mediterranean, the Adriatic and Central Europe.**

The report sent in was accepted.

SECOND COMMUNICATION. — **Economical and technical study of the mechanical traction of boats on rivers, canals and lakes.**

This report owing to its importance should be included among the Questions of a future Congress.

THIRD COMMUNICATION. — **The mortgaging of inland shipping.**

The Congress accepts the resolution of the Amsterdam Conference in regard to uniformity of legislation in the matter of maritime mortgages and resolves that the institution of river mortgages, that is: mortgages on vessels engaged in inland navigation, should be included in all legislations.

FOURTH COMMUNICATION. — **Have the rivers flowing southward from the Alps the characteristics, and are their hydraulic conditions such, as to render possible the institution of movable dams like those in use on northern rivers, to prevent the fall of the water level with the ebbing tide, and to provide the necessary anchoring ground for shipping.**

No report was received on this subject.

FIFTH COMMUNICATION. — **Study of the effects produced by the cutting of navigable canals on underground water systems.**

The report sent in was accepted.

---

1. In accordance with article 14 of the Regulations of the Permanent International Association of Navigation Congresses "*Communications are not put to the vote or discussed at the meetings.*"

Sixth Communication. — **Results obtained by dredging in increasing the depth of water of rivers. Technical and administrative organization of works undertaken with this object.**

It was suggested that, in consequence of the good results of the dredging done on the Po under the supervision and at the cost of the Italian Government in 1904, the Government should itself purchase at once, or at least employ, two or three dredgers to ensure the navigability of this river.

SECOND SECTION

OCEAN NAVIGATION

First Question. — **Improvement of the mouths of rivers discharging into tideless seas.**

CONCLUSIONS ADOPTED:

The system of jetties is to be recommended so long as the distance between the bar and the shore does not lead to excessive cost.

In the contrary case, and especially for deltas which have become firm in the course of years, dredging, since the adoption of suction dredges, offers an excellent solution of the problem, provided that the amount of traffic justifies the expense involved in dredging.

Dredging is useful, in certain cases, to hasten or complete the action of jetties; should neither of these systems be suitable, the lateral canal, having its outlet placed beyond the action of the delta, would offer a simple and certain solution.

Second Question. — **Progress in methods of propulsion of vessels. Effect of these on channels and harbours.**

CONCLUSIONS ADOPTED:

In the present state of technical development, the progress made in the methods of propelling ships has no influence on the arrangements of channels and ports.

THIRD QUESTION. — **Review of the various methods of working and administration of seaports. Their influence on the development of trade.**

CONCLUSIONS ADOPTED:

Any system of administration which favors the prosperity of the port and the development of traffic is good, provided that the administation be good itself.

FOURTH QUESTION. — **Conditions affecting the force of waves and the construction of breakwaters to resist them.**

CONCLUSIONS ADOPTED:

The power of waves and the essentially dynamic efforts which they bring to bear on outside breakwaters have been until now beyond any exact measurement.

The effects of destruction on sea-works are due to a repetition of dynamic efforts which in like manner, it has been so far impossible to determine.

In projects for new works in the open sea, the engineer will find most valuable information by examining existing works, by taking into comparative consideration the regimen of the swell outside, the shape of the shores and the lay of the bed of the sea in the approaches to the port, and every other condition which may give him useful elements on which to work.

The Congress refers to the information furnished by the written reports and oral observations, considers that engineers will find there information of great value for the construction of breakwaters, taking the force of waves into consideration but, by reason of the great diversity of cases, does not think that it should formulate any absolute conclusions.

B. — COMMUNICATIONS.

First Communication. — **Rapid increase in the dimensions of steamers and sailing vessels. Their draught of water. Effects of the increase on the harbours, canals and approaches.**

In view of the importance of the subject, it should be included in the Questions to be discussed at the next Congress.

Second Communication. — **The use of liquid fuel for purposes of navigation.**

Petroleum motors for navigation can and should be applied more widely for powers up to 500 H.P.

Third Communication. — **The transport of cargo by ferry-boats.**

This communication was not the subject of any resolution.

Fourth Communication. — **Report on the most recent works carried out in the principal seaports.**

The reports sent in were accepted.

Fifth Communication. — **Responsibility of ship owners in regard to private parties or public administrations.**

It is highly desirable that the various States agree as soon as possible on some uniform legislation.

Sixth Communication. — **Coast signals. — Lightships. — Wireless telegraphy.**

The reports sent in were accepted.

Seventh Communication. — **Measures adopted by the different governments for the protection of ocean navigation. Bounties. Reduced railway tariffs for merchandise intended to be transported by sea.**

The reports sent in were accepted.

INTERNATIONAL

NAVIGATION CONGRESS

XIth Congress

St-Petersburg 1908

PROGRAMME OF THE PROCEEDINGS OF THE CONGRESS

FIRST SECTION

INLAND NAVIGATION

A. — QUESTIONS.

First Question. — **Arrangement to be given to weirs in rivers having great variations of discharge and occasionally carrying down large quantities of ice, so as to serve the interests of navigation and industry.**

Second Question. — **Study of the economic and technical conditions of the working arrangements and mechanical traction of boats on rivers, canals and lakes, and of the regulations necessary for this purpose. — Monopoly of traction.**

Third Question. — **Equipment of ports of inland navigation, especially the advance made in electric plants.**

FOURTH QUESTION. — **Canals which serve both for navigation and for irrigation.**

FIFTH QUESTION. — **Protection of low-lying lands against invasion by water.**

B. — COMMUNICATIONS.

FIRST COMMUNICATION. — **Application of reinforced concrete to hydraulic constructions.**

SECOND COMMUNICATION. — **Participation of the Government and the various parties interested in the expenses necessary for the development of inland navigation, including, if required, the power to be given to the Government to acquire a part of the land which would be improved in value along new waterways.**

THIRD COMMUNICATION. — **Hydrometric services, prediction of floods and depths of water.**

SECOND SECTION

OCEAN NAVIGATION

A. — QUESTIONS.

FIRST QUESTION. — **Fishery harbours and harbours of refuge for the coasting trade.**

SECOND QUESTION. — **Inland maritime ports and means of access thereto. Their advantages. Economic and technical study.**

THIRD QUESTION. — **Construction of ports on sandy shores.**

FOURTH QUESTION. — **General conditions for the security of maritime navigation.**

FIFTH QUESTION. — **Hydrographic exploration of the sea.**

B. — COMMUNICATIONS.

FIRST COMMUNICATION. — **Appliances for repairs (dry docks, floating docks, lifting apparatus, etc.).**

SECOND COMMUNICATION. — **Best types of sea-going vessels for transporting freigt, in their relation to inland navigation ports and waterways.**

THIRD COMMUNICATION. — **Application of reinforced concrete to maritime works. Means to insure its preservation.**

FOURTH COMMUNICATION. — **Report on the most recent works carried out in the principal sea-ports.**

NAMES OF THE REPORTERS

AND

TITLES OF THE REPORTS SUBMITTED TO THE XIth CONGRESS

NAMES OF THE GENERAL REPORTERS

First Section. — Inland Navigation.

A. — QUESTIONS.

FIRST QUESTION. — *Arrangement to be given to weirs in rivers having great variations of discharge and occasionally carrying down large quantities of ice, so as to serve the interests of navigation and industry.*

1. **Maximoff,** S. P. — *General report.* (Russia) (F.E.G.)

2. **Schnapp** and **Carstanjen.** — The construction of weirs in rivers with considerable variations in their water-level and subject on occasion to strong icedrift, with regard to the interests of navigation and industry. (Germany) (G.E.F.)

3. **Deinlein,** A. — Recent designs of movable weirs for the most favourable utilisation of water. (Austria) (G.E.F.)

4. **Sibert,** W. L. — Arrangement to be given to weirs in rivers having great variations of discharge and occasionally carrying down large quantities of ice, so as to serve the interests of navigation and industry. (United States) (E.F.G.)

N. B. — 1. The name of a country, in brackets, after the title of a report, indicates the nationality of the writer.

2. The letters E, F, and G, in brackets, indicate whether the report was published in English (E.) in French (F.), or in German (G.). The first letter in the bracket indicates the language in which the original report was written.

5. **Cipoletti,** C. — Arrangement to be given to weirs in rivers having great variations of discharge and occasionally carrying down large quantities of ice, so as to serve the interests of navigation and industry. (Italy) (F.E.G.)

6. **de Timonoff,** V. E., and **Tsionglinsky,** M. F. — Arrangement of weirs with large variations of water-level and occasional strong icedrift, with regard to the interests of navigation and industry. (Russia) (F.E.G.)

7. **Hansen,** F. V., and **Malm,** G. — Two important weirs on Swedish rivers. (Sweden) (G.E.F.)

SECOND QUESTION. — *Study of the economic and technical conditions of the working arrangements and mechanical traction of boats on rivers, canals and lakes, and of the regulations necessary for this purpose. — Monopoly of traction.*

8. **Merczyng,** M. Ch. — *General report.* (Russia) (E.F.G.)

9. **Bredow,** T., and **Teubert,** O. — The economical, technical and legislative examination of mechanical traction and towing monopoly on canals and rivers. (Germany) (G.E.F.)

10. **Havestadt,** C. — Proceedings of a special committee of the German-Austro-Hungarian Society of Inland Navigation on the towing monopoly and mechanical ship-traction on canals. (Germany) (G.E.F.)

11. **Saner,** J. A. — Study of the economic and technical conditions of the working arrangements and mechanical traction of boats on rivers, canals and lakes, and of the regulations necessary for this purpose. — Monopoly of traction. (Great-Britain) (E.F.G.)

12. **Marlio,** L. — Study of the economics and regulations for the operating and mechanical traction of boats on rivers, canals and lakes. (France) (F.E.G.)

13. **Tsionglinsky,** M. F. and **Roundo,** A. M. — Mechanical traction of boats on the Ladoga canals. (Russia) (F.E.G.)

THIRD QUESTION. — *Equipment of ports of inland navigation, especially the advance made in electric plants.*

14. **Romanoff,** A. D. — *General report.* (Russia) (F.E.G.)

15. **Ottmann.** — Equipment of inland harbours, with more especial reference to progress made in their electric installations. (Germany) (G.E.F.)

16. **Sheridan,** R. B. — The equipments of ports on the great inland lakes of North Amerika. (United States) (E.F.G.)

17. **Bela de Gonda.** — The commercial harbour of Buda-Pesth. (Austria) (G.E.F.)

18. **Cervais,** B., and **Tsimbalenko,** L. — Inland navigation ports in Russia. (Russia) (F.E.G.)

FOURTH QUESTION. — *Canals which serve both for navigation and for irrigation.*

19. **Rytel,** M. F. —*General report.* (Russia) (F.E.G.)

20. **Buckley,** R. B. and **Brown,** H. — The advantages and disadvantages of canals employed both for irrigation and navigation. (Great-Britain) (E.F.G.)

21. **Newell,** F. H. — Canals useful in navigation and agriculture. (United States) (E.F.G.)

22. **Levy-Salvador,** P. — Mixed canals which can be used both for navigation and agriculture. (France) (F.E.G.)

23. **Sanjust di Teulada,** E., **Bifulco,** O., and **Cucchini,** E. — On canals which are used jointly for navigation and agricultural purposes. (Italy) (F.E.G.)

24. **Toukholka,** V. — Combined canals for the service of navigation and agriculture. (Russia) (F.E.G.)

FIFTH QUESTION. — *Protection of low-lying lands against invasion by water.*

25. **Colovnine,** D. N. — *General report.* — (Russia) (F.E.G.)

26. **Ockerson,** A. — Protection of low lying lands against the invasion of water. The Level system of the Mississippi River and the protection of Salton Basin. (United States) (E.F.G.)

27. **Troté,** A. — A general study of the various means used in France to protect the land from invasion by water. (France) (F.E.G.)

28. **de Kvassay,** E. — Flood-prevention and drainage in Hungary. (Hungary) (F.E.G.)

29. **Rytel,** M. — Preservation of low-lying ground against the inroads of water in the Terek valley. (Russia) (F.E.G.)

B. — COMMUNICATIONS.

FIRST COMMUNICATION. — *Application of reinforced concrete to hydraulic constructions.*

30. **Drouginine,** S. I. — *General report.* (Russie) (F.E.G.)

31. **Müller,** S. — Employement of reinforced concrete in hydraulic constructions. (Germany) (G.E.F.)

32. **Noble Twelvetrees,** W. — Some applications of reinforced concrete to inland navigation works in the United Kingdom. (Great Britain) (E.F.G.)

33. **de Préaudeau,** A. — Note on the applications of ferro-concrete in subaqueous construction (internal navigation). (France) (F.E.G.)

34. **Wouter Cool.** — Use of reinforced concrete in hydraulic works. (Netherlands) (F.E.G.)

35. **Vosnessenski,** P. — Applications of reinforced concrete to hydraulic constructions. (Russia) (F.E.G.)

36. **Carling**, W., and **Lundberg,** A. — Quay walls of reinforced concrete in Stockholm and Norrköping. (Sweden) (G.E.F.)

SECOND COMMUNICATION. — *Participation of the Government and the various parties interested in the expenses necessary for the development of inland navigation, including, if required, the power to be given to the Government to acquire a part of the land which would be improved in value along new waterways.*

37. **Kounitzky,** S. K. — *General report.* (Russia) F.E.G.)

38. **Kisker** and **Ragoczy.** — Co-operation of the Government and of the parties interested in the measures for the development of inland navigation, eventually including that of the concession to the Government of the right of eventually purchasing part of the strip of land which is to be utilized along the banks of a new waterway. (Germany) (G.E.F.)

39. **d'Hénouville,** M. — Methods of Government intervention, as well as various parties concerned, in the raising of funds required for the development of inland navigation. (France) (F.E.G.)

40. **Ivanovsky,** A. V. — Ways in which the Government and interested parties can share in the supplying of funds necessary for the development of inland navigation. (Russia) (F.E.G.)

THIRD COMMUNICATION. — *Hydrometric services, prediction of floods and depths of water.*

41. **Kleiber,** W. H. — *General report.* (Russia) (F.E.G.)

42. **Bindemann,** H., and **Hensel,** J. — Hydrological knowledge and high-water and ice drift reporting service in Germany. (Germany) (G.E.F.)

43. **Maillet**, E. — Note regarding the present state of the hydrometric services and announcement of floods in France. (France) (F.E.G.)

44. **Valentini,** C. — Hydrometric service for recording floods and low water. (Italy) (F.E.G.)

45. **Lewandowski,** F. — The dependence of the water levels of lake Beloosero on atmospheric precipitations in its alimentary basin. (Russia) (G.E.F.)

Second Section — Ocean Navigation

A. — QUESTIONS.

FIRST QUESTION. — *Fishery harbours and harbours of refuge for the coasting trade.*

46. **Rummel,** V. Y. — *General report.* (Russia) (F.E.G.)

47. **Wilhelms.** — Fishery harbours and harbours of refuge for the coasting trade. (Germany) (G.E.F.)

48. **Carey,** A. E. — Fishery harbours and harbours of refuge for the coasting trade. (Great-Britain) (E.F.G.)

49. **Bottemanne,** J. M., and **Van Oordt,** H. — Dutch fishery harbours. (Netherlands) (F.E.G.)

50. **Silitsch.** — Harbours of refuge for the Russian coasting vessels in the Baltic Sea. (Russia) (F.E.G.)

SECOND QUESTION. — *Inland maritime ports and means of access thereto. Their advantages. Economic and technical study.*

51. **de Szystovski,** M. A. — *General report.* (Russia) (F.E.G.)

52. **Rosing,** J., and **Suling,** E. — Inland sea-ports and their approaches. Their advantages. Economic and technical review. (Germany) (G.E.F.)

53. **Hunter,** W. H.— Inland maritime ports and means of access thereto. Their advantages. Economic and technical study. (Great Britain) (E.F.G.)

54. **de Smet de Naeyer**, M., and **Crenier,** L. — Inland sea-ports and their means of access. Their advantages. Economic and technical study. (Belgium) (F.E.G.)

55. **Vidal,** M. — Inland ports. (France) (F.E.G.)

56. **Orlando,** P. — Inland maritime ports and the means of access thereto. (Italy) (F.E.G.)

57. **de Timonoff,** V. E. — The maritime ports situated along the large navigable inland waterway between the Baltic Sea and White Sea, and the means of access thereto. (Russia) (F.E.G.)

58. **Jaba,** A. — The inland sea-ports of the Jenissei and the means of access to them in the light of the results of the special expedition organised in 1905 by the Ministry of Ways of Communication. (Russia) (F.E.G.)

59. **Ciroukhine**, J. — Inland maritime ports and their approaches. Their advantages; economic and technical considerations. (Russie) (F.E.G.)

THIRD QUESTION. — *Construction of ports on sandy shores.*

60. **Brandt,** A. A. — *General report.* (Russia) (F.E.G.)

61. **Vernon-Harcourt,** L. F. — The construction and maintenance of sea-ports on sandy coasts. (Great-Britain) (E.F.G.)

62. **Sandford,** J. C. — Construction of ports on sandy shores. Ports of the United States on the Atlantic Ocean, Gulf of Mexico, Pacific Ocean and the Great Lakes. (United States) (E.F.G.)

63. **Lo Catto,** D. — Construction of harbours on sandy beaches. (Italy) F.E.G.)

64. **Wortman**, H. — Construction of harbours on sandy foreshores. (Netherlands) (F.E.G.)

65. **Ivanina** and **Ekerlé.** — The most important Russian ports on the sandy coasts of the Baltic. (Russia) (F.E.G.)

FOURTH QUESTION. — *General conditions for the security of maritime navigation.*

66. **de Schokalsky**, J. M. — *General report.* (Russia) (F.E.G.)

67. **Rota,** G. — General conditions for the security of navigation. (Italy) (F.E.G.)

68. **Anfimoff,** W. — General conditions of maritime navigation and luminous signals. (Russia) (F.E.G.)

69. **de Schokalsky,** J. M. — The general conditions influencing the safety of maritime of navigation. (Russia) (F.E.G.)

70. **de Timonoff,** V. E. — The salving of stranded vessels. (Russia) (G.E.F.)

71. **Spitzin**, W. — General conditions for the security of maritime navigation. (Russia) (G.E.F.)

FIFTH QUESTION. — *Hydrographic exploration of the sea.*

72. **Mordovine,** K. P. — *General report.* (Russia) (F.E.G.)

73. **Marzolo,** P. — Report on the present conditions of Italian hydrography. (Italy) (F.E.G.)

74. **Maximoff,** S. — Present state of the exploration of the Baltic sea from the point of view of safety of navigation. (Russia) (F.E.G.)

75. **Mordovine,** K. — Hydrographic studies of seas. (Russia) (F.E.G.)

B. — COMMUNICATIONS.

FIRST COMMUNICATION. — *Appliances for repairs (dry docks, floating docks, lifting apparatus, etc.)*

76. **Tréniukhinn,** W. M. — *General report.* (Russia) (F.E.G.)

77. **Asmussen,** G. — Docks. Dry docks, floating docks, lifting apparatus, etc. (Germany) (G.E.F.)

78. **Barbé,** J. — Dry docks recently constructed in France and at its naval bases. (France) (F.E.G.)

79. **Nobel.** — Floating dock N° 4 of the city of Rotterdam. (Netherlands) (F.E.G.)

80. **Bieliawin,** L. — The dry docks in the Emperor Alexander III harbour. (Russia) (F.E.G.)

81. **de Timonoff,** V. E. — Temporary dry docks for rapid construction. (Russia) (F.E.G.)

82. **Polssadoff,** J. — Dry docks for the repair and construction of vessels. (Russia) (F.E.G.)

SECOND COMMUNICATION. — *Best types of sea-going vessels for transporting freight, in their relation to inland navigation ports and waterways.*

83. **Boklevsky,** C. — *General report.* (Russia) (F.E.G.)

THIRD COMMUNICATION. — *Application of renforced concrete to maritime works. Means to insure its preservation.*

84. **Abramoff,** N. M. — *General report.* — (Russia) (F.E.G.)

85. **Moeller.** — Communication relating to the application of hydraulic ferro-concrete to sea-works. Means for its preservation. (Germany) (G.E.F.)

86. **Noble Twelvetrees,** W. — Some applications of reinforced concrete to maritime works in the chief ports of the United Kingdom. (Great-Britain) (E.F.G.)

87. **Voisin,** J. — The application of reinforced concrete to maritime construction in France. Methods for insuring its preservation. (France) (F.E.G.)

88. **Wouter Cool.** — Employment of reinforced concrete for hydraulic constructions. Means for assuring its durability. (Netherlands) (F.E.G.)

89. **Nikolsky,** A. — Application of reinforced concrete to maritime works. (Russia) (F.E.G.)

FOURTH COMMUNICATION. — *Report on the most recent works carried out in the principal sea-ports.*

90. **Yankowsky,** P. — *General report.* — (Russia) (F.E.G.)

91. **Molini,** L., and **Arenal,** F. — Note on the ports of Spain. (Spain) (F.E.G.)

92. **Quinette de Rochemont** (Baron). — Account of the most recent works carried out in the principal seaports of France. (France) (F.E.G.)

93. **Bela de Conda.** — The Hungarian mercantile marine and the port of Fiume. (Hungary) (G.E.F.)

94. **Coen Cagli,** E. — New works in the sea-ports of Italy. (Italy) (F.E.G.)

95. **Guersevanoff,** N., **Dmitrieff,** V., and **Dratch,** F. — Account of the works most recently carried out at the principal sea-ports. (Russia) (F.E.G.)

VARIOUS PUBLICATIONS

Publications of the Organising Committee:

96. Time Table of the Congress. (F.E.G.)
97. Guide to the excursions of the Congress. (F.E.G.)
98. Plan-programme of the excursion on the Neva. (F.)

Publications by the Ministry of Means of Communication:

99. Uebersicht der Binnenschiffahrt in Russland. (G.)
100. The inland waterways of Russia. (F.)
101. The Marie canal. (F.R.)
102. The Neva and the Ladoga canals. (F.R.)
103. The Volga. (F.R.)

Publications by the Ministry of Marine:

104. Catalogue of the exhibition of the XIth International Congress. (F.R.)

105. Historical sketch and description of Cronstadt, by Dorogoff. (F.R.)
106. Historical sketch of the Torpedo school 1874-1880. Cronstadt, by Gitkoff. (F.R.)
107. School of instruction for artillery officers. Cronstadt, by Kazmitcheff. (F.R.)
108. The Emperor Nicholas I school of Naval Engineering. Cronstadt, by Podogine. (F.R.)
109. The marine Observatory and Compass-Observatory. Cronstadt, by von Blumback. (G.R.)
110. The School of Naval artificiers of the Baltic fleet. Cronstadt, by Baranzoff. (F.R.)
111. The School of Diving and Sub-marine work, by Kokonoff. (F.R.)
112. Summarized sketch of the development of sub-marine navigation in Russia and abroad, by Vinogradoff. (F.R.)
113. The Ijora Works (F.R.)
114. The Oboukoff Works, by Kaptereff. (F.R.)
115. The Baltic Naval ship-building establishment and workshop (F.R.)
116. The construction of ships for the Imperial Navy at the State ship-yards. St. Petersburg, by Cherchoff. (F.R.)
117. The Naval Museum. St. Petersburg, by Ogorodnikoff. (F.R.)
118. The Nicholas Marine corps and Naval Academy at St. Petersburg, by Maximoff. (F.R.)
119. Historical sketch of the growth of pilotage in Russia, by Sabo. (F.R.)
120. The general administration of hydrography, by Bialokoz. (F.R.)
121. The workshop for nautical instruments at the Hydrographic Department, by Achmatoff. (G.R.)
122. The workrooms for the reproduction of the cartographic work of the Hydrographic Department, by Bialokoz and Janoff. (F.R.)
123. Hydrographic survey-work of the Russian seas. Charts and nautical instructions, by Bouchteeff. (F.R.)

124. Historical sketch of the lighthouse service in Russia, by Pridovsky. (F.R.)

Publications by the Ministry of Commerce:

125. Historical sketch of the development of the Russian merchant service. (F.R.)
126. Commercial ports of Russia in Europe (F.R.)

Publications by the Ministry of Agriculture:

127. Hydrotechnical works carried out around the trans-Siberian railway. (F.)
128. Works carried out by the western expedition for draining the Pinsk marshes. (F.)
129. Drainage works carried out in the marshy districts of northern Russia. (F.)
130. Conditions and aims of the agricultural hydrotechnical works carried out in Russia. (F.)
131. Hydrotechnical works in Turkestan. (F.)
132. Agricultural works in Russia. (F.R.)
133. Water-supply works and irrigation in South Russia. (F.)
134. On the accumulation and consumption of moisture in the bed of the water sheds of the rivers running through level plains, by E. Oppokoff. (F.)
135. The Volunteer fleet of Russia. (F.)
136. The League for the renewing of the fleet. (F.R.)
137. The Volga Navigation Company. (F.R.)
138. The Terminus-Port of the Trans-Siberian Railway, by V. E. de Timonoff. (R.)
139. The regulation of the flow of rivers by mechanical dredging, by V. E. de Timonoff. (F.G.E.R.)
140. The IXth International Navigation Congress, by V. E. de Timonoff. (R.)
141. The rapids of the Dnieper, by V. E. de Timonoff. (F.G. E.R.)
142. Suction-dredgers, by V. E. de Timonoff. (F.R.)
143. A moveable weir with automatic regulating sluices, by Imchenetski. (F.)

144. The waterways of Finland. (F.R.)
145. The port of Horly. (F.)
146. The Ochta bridge over the Neva, at St. Petersburg. (F.)
147. The Central Chamber of weights and measures. (F.)
148. The Emperor Alexander Institute of Means of Communication, at St. Petersburg. (F.)
149. The ice at the bottom of rivers and its disastrous effect in times of frost, by L. Wladimiroff. (F.R.)
150. Das Schiffshebewerk "Oelhafen-Lohle". (G.E.F.)

Publications by the Permanent International Association of Navigation Congresses.

151. *Summarised report of the Congress.* Brussels, 1908. (F.E.G.)
152. *Report of the proceedings of the Congress.* Brussels, 1908. (F.E.G.) (1)

Publication by the French Ministry of Public Works.

153. Reports of the French delegates on the proceedings of the Congress.
Ministry of Public Works. Paris, 1910. (F.)

---

(1) The Local Organising Committee published in Russian the reports submitted to the Congress, as well as the Report of the proceedings.

N. B. — The letter R, in brackets, placed after various publications indicates that they were printed in Russian.

CONCLUSIONS

ADOPTED BY THE XI[th] CONGRESS

FIRST SECTION

INLAND NAVIGATION

FIRST QUESTION. — **Arrangement to be given to weirs in rivers having great variations of discharge and occasionally carrying down large quantities of ice, so as to serve the interests of navigation and industry.**

CONCLUSIONS ADOPTED :

1. These points should be observed in the construction of dams : —

a) The level of the surface of the pool should be regulated as accurately as possible;

b) Quickness of working should be assured and its safety be increased by placing the operating machinery on the permanent works;

2. It is important that the whole width of the dam should be opened as quickly as possible, especially on rivers subject to sudden rises or carrying large amounts of ice;

It is well to be able to withdraw from the water all the movable parts of the work;

Dams with movable gates and supports, and also drum dams have been fully tested.

The latter have the advantage of allowing a certain quantity of ice to pass without reducing perceptibly the level up stream;

3. The system of movable dams which, if needs be, furnishes the means of maintaining, during the passage of floods and ice, the head of water required for driving the factories which

use it, depends upon the regimen of the stream. There are to be found already at many places, dams of the kind which, in a single piece, cover an opening 30 metres in width;

4. Fixed dams are advisable for wide rivers liable to heavy accumulations of ice when the level of the upper pool need not be exactly preserved;

5. The defect of fixed dams, which do not allow the level of the pool to be regulated, may be remedied in certain cases by making the upper part movable, or by building a movable dam alongside of the fixed dam;

6. The study of a dam should be accompanied by observations on the way in which the ice forms, and on the way in wich the cakes of ice are carried by the river; it requires also a knowledge of the conditions under which the work has to stand impact of the ice.

SECOND QUESTION. — **Study of the economic and technical conditions of the working arrangements and mechanical traction of boats on rivers, canals and lakes, and of the regulations necessary for this purpose. — Monopoly of traction.**

CONCLUSIONS ADOPTED:

1° Traction on canals:

a) No general solution can be given for the question of knowing whether monopoly of traction should be obligatory on canals; it is proved however that increase of traffic leads necessarily to the organization of a technical service which ensures the highest efficiency to the canal. This result is obtained first by a uniformly regulated traction service to be established by the owner of the canal or his representative;

b) The economic and financial conditions of canals being liable to quite frequent changes, the influence of the uniformly regulated service upon the said conditions ought to be studied in each special case. But the traction monopoly, if it be granted, ought not in any case to give the right of establishing a tariff higher than what is necessary to defray the expenses of operating and to guarantee the sinking fund and interest of the capital invested;

2° Traction upon canalized rivers:

On account of the diversity of local conditions, it is impossible to formulate, for canalized rivers, any general opinion on the organization of traction. But, in this case also, the increase of traffic will force the adoption of a uniformly administered traction service so as to attain the maximum efficiency of the navigable highway;

3° Traction on rivers with an uninterrupted current;

In general, on non-canalized rivers, traction may remain free. But a traction service suited to the local conditions of the navigable highway can improve the traffic.

4° Considering the important progress realized of late on canals by uniformly regulated electric traction, the Congress resolves that electric traction on canals be presented as a question in the order of business of the next Congress.

THIRD QUESTION. — **Equipment of ports of inland navigation, especially the advance made in electric plants.**

CONCLUSIONS ADOPTED:

An inland navigation port should satisfy the following conditions: —

1. To be established in a manner to serve best the interests of works and manufactories of the locality in question;

2. To provide: —

a) Convenient and accessible transfer stations between the waterway and railway;

b) Places for temporarily storing goods about to be re-forwarded;

FOURTH QUESTION. — **Canals which serve both for navigation and for irrigation.**

CONCLUSIONS ADOPTED:

1. The establishment of a mixed canal, at once meeting the requirements of navigation and of agriculture, raises numerous

local questions and therefore requires special consideration in each particular case;

2. In low lands well cultivated and with a dense population, irrigation and drainage canals can be utilized in some cases for transporting agricultural produce, manure and heavy goods of bulky size and little intrinsic value;

3. The consideration of questions regarding mixed canals is not yet sufficiently investigated and ought to be retained on the programme of the next Congress.

Fifth Question. — **Protection of low-lying lands against invasion by water.**

CONCLUSIONS ADOPTED:

1. The use of embankments which cannot be submerged, with the object of preserving low districts from the encroachment of the water of large rivers, has succeeded in numerous cases;

2. Insubmersible embankments built of earth can effect their object when the technical service is well organized and when maintenance works are well executed;

c) Special docks suitable for goods of different kinds;

d) Quays and other landings suited to the nature and importance of the traffic and extending as far as possible towards the centre of the districts to be served.

3. The maximum of economic efficiency is reached by the erection of protective works and by the simultaneous execution of agricultural improvement works in the protected districts: sometimes it is necessary to have an artificial outlet for the water;

4. Every step to be taken against the encroachment of the water should consider the changes which such steps might possibly bring about in the regimen of the river both above and below.

It is therefore advisable to execute only such works as will form a complete whole, well proportioned in all its details and applicable to the entire basin of the river.

B. — COMMUNICATIONS.

FIRST COMMUNICATION. — **Application of reinforced concrete to hydraulic constructions.**

This communication was linked to the third communication, and discussed by the second Section.

SECOND COMMUNICATION. — **Participation of the Government and the various parties interested in the expenses necessary for the development of inland navigation, including, if required, the power to be given to the Government to acquire a part of the land which would be improved in value along new waterways.**

CONCLUSIONS ADOPTED (1) :

1. Of all the financial means for creating and improving inland navigation lines, the ordinary State budget is the most regular, and the one most to be recommended.

Loans are justifiable in countries where the navigation lines are in a primitive condition or where the ordinary resources of the budget are also insufficient.

They can be redeemed by taxes levied on the boats, and by special rates on the increase in value of the lands and buildings adjoining the new route. The organizations and institutions which are interested can obtain redeemable grants from the State.

The taxes should absorb only a part of the profit obtained by the reduction of the cost of transportation due to the establishment or improvement of a line of navigation.

Taxes should form a separate account and their levy should cease from the time that the different expenses are met.

The rates on the increased value of land and buildings should not exceed in amount the half of the increased value.

---

1. Under Article 14, of the Regulations of the Permanent International Association of Navigation Congresses, "*Communications are not voted upon, nor are they brought up for consideration at a General Meeting.*"

The construction, maintenance and direction of the principal navigation lines should remain wholly in the hands of the State, the different parties interested being able to take part by lending their financial aid, and as members of the Inspection Committees:

2. In order to facilitate the establishment and improvement of navigation lines and local branches with these lines, and to guard against speculation in land values, the law should give the State and the organizations and institutions interested, the right of dispossession in all cases in which this may be considered indispensable for the public welfare.

Sufficient land should be condemned to provide not only for needs of construction, but also for a future extension of the establishments and installations connected with the navigable highway, and to prevent speculation.

The condemned ground may be leased to interested parties, and it may be resold at cost price, but only under wholly exceptional circumstances:

3. Local bodies (municipalities, boroughs, associations, industrial societies, etc.) may be entrusted to secure the funds necessary for the construction, extension or improvement of river ports, landings, docks and warehouses, and for the various equipments of these ports, as well as for the local lines of approach and connection from settlements, factories and centres of production to the navigable highway.

These funds can be obtained by means of a loan guaranteed by special taxes levied on the loading and discharging of boats as well as on the increased value of land and buildings.

It would be necessary to organize, for this purpose, syndicates or special bodies along the highways of inland navigation.

The State can share in these financial arrangements by subsidies which are to be paid back.

4. To manage lines of inland navigation, to find the movable plant for transportation, and to provide the various installations in river ports, private enterprise is admissible in the form of concessions, subsidized or not by the State or by public bodies;

5. As as first step toward inducing private enterprise to become more or less interested in the improvement of highways of inland navigation, it must be assured of as great stability as possible by means of legislative action without injury to public interests;

6. The development of the system of navigation lines and the raising of the necessary funds should be the object of a regular programme worked out by the State with the aid of all interested organizations and institutions.

The application of these projects is subordinate to the spirit, customs and legislation of each State; it can have no uniform nor absolute character.

THIRD COMMUNICATION. — **Hydrometric services, prediction of floods and depths of water.**

The majority of the Executive Committee is of the opinion that there is no reason for drawing up any conclusions on the subject of the third communication.

SECOND SECTION

OCEAN NAVIGATION

A. — QUESTIONS.

FIRST QUESTION. — **Fishery harbours and harbours of refuge for the coasting trade.**

CONCLUSIONS ADOPTED:

1. The development of the fishery industry and the improvement of coast navigation conditions are of great general interest:

They demand the establishment of Harbours of Refuge, Fishing ports of local importance, and large ports for the sea fishing;

2. Harbours of refuge for the coast trade should not be too costly, be placed in proximity to trade routes and afford safe anchorage. The access to these ports should be easy and safe for sailing vessels in all weathers, day and night. Such ports require no special equipment;

3. The sea fishing ports should afford facilities for unloading the fresh fish as quickly as possible, for its sale by auction, its packing, salting and forwarding inland by rail. With a view to this, the quay should be sufficiently wide for the erection of the necessary installations and for railway communication. Special quays should be reserved for berthing steam boats to be loaded with coal, provisions and fishing tackle;

The area of the water surface should be sufficient to afford anchorage not only to fishing boats, but also to ships which are driven to seek shelter in bad weather.

It is obvious that the selection of the position of shelter and fishing ports will depend on the local conditions of navigation for each country or district, and particularly on the stability and possible development of the fishing population.

For these different motives, detailed studies of sea coasts are indispensable.

SECOND QUESTION. — **Inland maritime ports and means of access thereto. Their advantages. Economic and technical study.**

CONCLUSIONS ADOPTED :

1. Inland maritime ports are generally more suited to the service of great navigation lines when the latter have their home port there; they are seldom suitable as ports of call.

To preserve and develop the commercial and economic character of inland ports it is desirable to guarantee to their approaches and their works such depths as shall be amply sufficient for the future, while keeping financial possibilities in view;

2. When the inland port is situated on a river, the depths ought, if possible, to reach the maximum consistent with the hydraulic power of the latter.

The approaches to inland ports should, in principle, be free of obstacles, such as bridges or locks, of which the number should be reduced to a minimum;

3. At the time of the establishment of an inland port, it is better to place it as far as possible in the interior, so as to bring it near the industrial and agricultural centres, while keeping in view the economic and social conditions of the country passed through.

If the harbour must remain far from the heart of this country, it is well to make it the terminus of a system of completed inland navigation lines.

THIRD QUESTION. — **Construction of ports on sandy shores.**

CONCLUSIONS ADOPTED:

1. The entrance to a harbour, situated on a lagoon opening into a sea, can be effected by means of parallel jetties built on the principal channel leading to the lagoon. The action of the tide is sometimes sufficient to insure the necessary depth of water over the bar which generally tends to form at the end of the jetties; but often dredging must be used in addition.

The strength of the tidal currents in the channel leading to the port should be increased by enlarging the capacity of the reservoir formed by the lagoon, and by closing the secondary arms of this lagoon;

2. Except in the case alluded to in the preceding paragraph, the maintenance of the depths can only be secured by means of dredging;

3. As parallel jetties give no roadsteads, and offer no special advantage from the point of view of maintaining depths, their use is only recommended in the case mentioned in the first paragraph above;

4. Jetties, whether parallel or converging, must, to be of service, be prolonged to depths where the erosive action of the sea is no longer felt;

5. Converging jetties must be strongly inclined towards the shore so as to offer no obstacle to the passage of alluvial deposits carried onward by the littoral currents;

6. In case the movement of materials along the shore be very great, it is of advantage to have recourse to moles or breakwaters parallel to the coast, or even to place the port out in deep water and to connect it to the ground by means of open piers. In this case the moles or orther works of entrance to the port should be as far from the shore as local circumstances permit.

FOURTH QUESTION. — **General conditions for the security of maritime navigation.**

FIFTH QUESTION. — **Hydrographic exploration of the sea.**

Conclusions adopted regarding the above Questions:

Whereas it would be of the greatest advantage to introduce uniformity in the wording of nautical directions, into the conventional signs made use of in nautical charts, and finally into the rules relating to navigation, to lighting and to buoying the coasts, the Second Section of the Congress resolves;

1. That the question be submitted (on the initiative of a Government, which could be well that of Russia) to an International Conference composed of seamen and civil engineers;

2. That this question be dealt with again at the next Congress.

B. — COMMUNICATIONS.

FIRST COMMUNICATION. — **Appliances for repairs (dry docks, floating docks, lifting apparatus, etc.).**

By reason of the complication of resolutions proposed and of the rules adopted by the Congresses, which make a distinction between communications and questions, it has been decided to express no definite conclusion, but to take into consideration the oral and written observations made during the sitting of the Congress; and the desire has been expressed that the communication (Repair Apparatus) should appear as a Question on the programme of the next Congress.

SECOND COMMUNICATION. — **Best types of sea-going vessels for transporting freight, in their relation to inland navigation ports and waterways.**

After hearing the Report of Professor Boklevsky on the best types of vessels intended for the transportation of freight, the Second Section has decided (1) to take note of this interesting communication and to forward to the author its sincere thanks.

THIRD COMMUNICATION. — **Application of reinforced concrete to maritime works. Means to insure its preservation.**

1. As to the use of reinforced concrete in the sea, if prudent counsel serve, it is to be considered that the first results are encouraging and that, by means of the adoption of a certain number of precautionary measures intended to prevent penetration by sea water (such as those pointed out by several writers), reinforced concrete allows the carrying out of certain works in special cases where other materials offer fewer advantages;

2. Seeing the favorable results of experience and the great importance of reinforced concrete, its application to highways of inland navigation and to maritime works should be put down as a *Question* in the order of business for the next Congress.

FOURTH COMMUNICATION. — **Report on the most recent works carried out in the principal sea-ports.**

The communication on the most recent works carried out in the principal seaports, for which Mr. Jankovski was appointed General Reporter, and which figured on the programme referring to ocean navigation, was not examined by the Second Section.

---

(1) According to Article 14 of the rules of the Permanent International Association of Navigation Congresses. « The communications are not voted upon, nor are they brought up for consideration at a general meeting. »

INTERNATIONAL

NAVIGATION CONGRESS

XIIth Congress

Philadelphia 1912

FIRST SECTION

INLAND NAVIGATION

A. — QUESTIONS.

First Question. — **Improvement of rivers by regulation and dredging and, if needs be, by reservoirs. Determination of the cases in which it is preferable to resort to such works rather than to canalization or the construction of a lateral canal.**

Second Question. — **Dimensions to be assigned, in any given country, to canals for heavy traffic. Principles of operating. Dimensions and equipment of the locks.**

Third Question. — **Intermediate and terminal ports. Best methods for combining, facilitating and harmonizing the transfer of freight between waterways and railways.**

B. — COMMUNICATIONS.

First Communication. — **Application of reinforced concrete to hydraulic works.**

SECOND COMMUNICATION. — **Report on the works undertaken and the measures adopted or proposed for the improvement and development of lines of inland navigation, as well as for the protection of the banks of navigable highways.**

THIRD COMMUNICATION. — **Utilization of the navigation of large but shallow rivers. Vessels and motors.**

SECOND SECTION

OCEAN NAVIGATION

A. — QUESTIONS.

FIRST QUESTION. — **Means for docking and repairing vessels.**

SECOND QUESTION. — **Dimensions to be given to maritime canals. (Technical point of view. Probable dimensions of the sea-going vessels of the future.)**

THIRD QUESTION. — **Mechanical equipment of ports.**

B. — COMMUNICATIONS.

FIRST COMMUNICATION. — **High powered dredges and means for removing rock under water.**

SECOND COMMUNICATION. — **Report on the most recent works constructed at the more important sea ports, especially those relating to breakwaters. Applications of reinforced concrete. Means for insuring its preservation.**

THIRD COMMUNICATION. — **Bridges and ferry bridges ; tunnels under waterways used for ocean navigation. Economic and technical study.**

FOURTH COMMUNICATION. — **Safety of navigation. Lighted buoys.**

NAMES OF THE REPORTERS

AND

TITLES OF THE REPORTS SUBMITTED TO THE XIIth CONGRESS

NAMES OF THE GENERAL REPORTERS

First Section. -- Inland Navigation.

A. — QUESTIONS.

FIRST QUESTION. — *Improvement of rivers by regulation and dredging and, if needs be, by reservoirs. Determination of the cases in which it is preferable to resort to such works rather than to canalization or the construction of a lateral canal.*

1. **Newcomer,** H. C.— *General Report.* (United States) (E.F.G.)

2. **Sympher**, L. — Improvement of rivers by regulation and dredging and, if needs be, by reservoirs. Determination of the cases in which it is preferable to resort to such works rather than to canalization, or the construction of a lateral canal. (Germany) (G.E.F.)

3. **Lauda,** E. — Influence of the Middle Elbe regulation on the drainage of the river Elbe below Melnik. (Austria) (G.E.F.)

N. B. — 1. The name of a country, in brackets, following the title of a report, indicates the nationality of the writer.

2. The letters F. G. and E, in brackets, indicate that the report was published in French (F.), in German (G.) or in English (E.). The first letter in the bracket indicates in what language the original report was written.

3. Reports 7. 17. 25. 26. 50. 66. 75. 87. 92. 99 and 115 are not noted, they were not printed as the writers were unable to complete their work before the opening of the Congress.

3bis. **Müller,** B. — Examination of the question of the possibility for the improvement of the navigability of the river Elbe, between Leitmeritz and Aussig, in Bohemia, by means of impounding reservoirs. (Austria) (G.E.F.)

4. **Harts,** Wm. W. — Improvement of rivers by regulation and dredging and, if needs be, by reservoirs. Determination of the case in which it is preferable to resort to such works rather than to canalization or the construction of a lateral canal. (United States) (E.F.G.)

5. **Landreth,** W. B. — Improvement of rivers by regulation and dredging and, if needs be, by reservoirs. Determination of the case in which it is preferable to resort to such works rather than to canalization or the construction of a lateral canal. (United States) (E.F.G.)

6. **Kauffmann,** M. — Improvement of rivers by regulation and dredging and, if needs be, by reservoirs. Determination of the case in which it is preferable to resort to such works rather than to canalization or the construction of a lateral canal. (France) (F.E.G.)

8. **de Kvassay,** E. — Canalization of Hungarian rivers (Hungary) (F.E.G.)

9. **Valentini,** C. — Improvement of rivers by regulation and dredging and, if needs be, by reservoirs. Determination of the case in which it is preferable to resort to such works rather than to canalization or the construction of a lateral canal. (Italy) (F.E.G.)

10. **Cockinga**, R. H., **Baucke,** H., **van Konynenburg,** E., and **Jonkheer van Panhuys,** C. W. — Improvement of rivers by regulation and dredging and, if needs be, by reservoirs. Determination of the case in which it is preferable to resort to such works rather than to canalization or the construction of a lateral canal. (Netherlands) (F.E.G.)

11. **de Timonoff,** V. E., and **Kleiber,** G., H. — Improvement of the navigability of rivers having but a single current, in their non-maritime portion. (Russia) (F.E.G.)

SECOND QUESTION. — *Dimensions to be assigned, in any given country, to canals of heavy traffic. Principles of operating. Dimensions and equipment of the locks.*

12. **Noble,** A. —*General Report.* (United States) (E.F.G.)

13. **Germelmann,** W. — Dimensions of the canals for heavy traffic in Germany. Principles of operating. Dimensions and equipment of the locks. (Germany) (G.E.F.)

14. **Claudot,** P. — Dimensions to be assigned, in any given country, to canals of heavy traffic. Principles of operating. Dimensions and equipment of the locks. (Belgium) (F.E.G.)

15. **Hodges,** H. F. — Dimensions to be assigned, in any given country, to canals of heavy traffic. Principles of operating. Dimensions and equipment of locks. (United States) (E.F.G.)

16. **Bourgougnon,** J. — Dimensions to be assigned, in any given country, to canals of heavy traffic. Principles of operating. Dimensions and equipment of the locks. (France) (F.E.G.)

18. **Sanjust di Teulada,** E. — Dimensions to be assigned, in any given country, to canals of heavy traffic. Principles of operating. Dimensions and equipment of the locks. (Italy) (F.E.G.)

19. **Pouzirevsky,** N. — Dimensions of canals for through navigation in a given country. Principles of operating. How the locks should be arranged. (Russia) (F.E.G.)

20. **Hansen,** F. V. — Dimensions to be assigned, in any given country, to canals for heavy traffic. Principles of operating. Dimensions and equipment of locks. (Sweden) (E.F.G.)

THIRD QUESTION. — *Intermediate and terminal ports. Best methods for combining, facilitating and harmonizing the transfer of freight between waterways and railways.*

21. **Johnson,** E. R. — *General Report.* (United States) (E.F.G.)

22. **Eisenlohr.** — Intermediate and terminal ports. Best methods for combining, facilitating, and harmonizing the transfer of freight between the waterway and the railway. (Germany) (G.E.F.)

23. **Tomkins,** C., and **Staniford,** C. W. — Improved methods for the transfer of freight between the waterfront, the railway and the warehouse. (United States) (E.F.G.)

23bis. **Huebner,** G. G. — Terminals on American inland waterways. (United States) (E.F.G.)

24. **Mallet,** P. — Intermediate and terminal ports. Best methods for combining, facilitating and harmonizing the transfer of freight between waterway and railway. (France) (F.E.G.)

27. **Tsionglinsky,** M. — Inland river ports in Russia. (Russia) (F.E.G.)

B. — COMMUNICATIONS.

FIRST COMMUNICATION. — *Application of reinforced concrete to hydraulic works.*

28. **Sewell,** J. S. — *General Report.* (United States) (E.F.G.)

29. **Schnapp,** F. — The use of reinforced concrete in hydraulic works. (Germany) (G.E.F.)

30. **Humphrey,** R. L. — The application of reinforced concrete to hydraulic works. (United States). (E.F.G.)

31. **Jacquinot,** M. — Note on the employment of ferro-concrete for structures exposed to the action of water. (France) (F.E.G.)

32. **Vawdrey**, R. W. — Application of reinforced concrete to hydraulic works. (Great Britain) (E.F.G.)

33. **The Hungarian State Water Survey.** — The use of reinforced concrete in hydraulic works. (Hungary) (F.E.G.)

34. **Perilli,** M. — Applications of reinforced concrete to hydraulic works. (Italy) (F.E.G.)

35. **Nikolsky,** A. — Applications of reinforced concrete to hydraulic works. (Russia) (F.E.G.)

SECOND COMMUNICATION. — *Report on the works undertaken and the measures adopted or proposed for the improvement and development of lines of inland navigation, as well as for the protection of the banks of navigable highways.*

36. **Newcomer,** H. C. — *General Report.* (United States (E.F.G.)

37. **Bergius,** R. — Report on the works undertaken and the measures adopted or proposed for the improvement and development of lines of inland navigation, as well as for the protection of the banks of navigable highways. (Germany) (G.E.F.)

38. **Marote,** E. J., and **Descans,** J. — Report on the works undertaken and the measures adopted or proposed for the improvement and development of lines of inland navigation in Belgium, as well as for the protection of the banks of navigable highways. Belgium) (F.E.G.)

39. **Connor,** W. D. — The inland navigation lines of the United States. (United States) (E.F.G.)

40. **Dusuzeau,** L. — Report on the works undertaken and the measures adopted or proposed for the improvement and development of lines of inland navigation, as well as for the protection of the banks of navigable highways. (France) (F.E.G.)

41. **Saner,** J. A. — Report on the works undertaken and the measures adopted or proposed for the improvement and development of lines of inland navigation, as well as for the protection of the banks of navigable highways. (Great Britain) (E.F.G.)

42. **Castiglione,** A. and **Beretta,** M. — The "Bertolini" law in respect of inland navigation in Italy. (Italy) (F.E.G.)

43. **van Loon,** A. R. — Report on the works undertaken and the measures adopted or proposed for the improvement and development of lines of inland navigation, as well as for the protection of the banks of navigable highways. (Netherlands) (F.E.G.)

44. **Wodarsky,** E. A. — The navigable inland waterways of Russia. The present condition of the navigable inland waterways of European and Asiatic Russia, and the means employed for their improvement and development. (Russia) (F.E.G.)

44a. **de Hoerschelmann,** E. — Notes on a preliminary project for improving the navigability of the Dnieper cataracts, with their utilisation for motive power. (Russia) (F.E.G.)

45. **Malm,** G. — Report on the works undertaken and the measures adopted or proposed for the improvement and development of lines of inland navigation, as well as for the protection of the banks of navigable highways. (Sweden) (E.F.G.)

THIRD COMMUNICATION. — *Utilization of the navigation of large but shallow rivers. Vessels and motors.*

46. **Beach,** L. H. — *General Report.* (United States) (E.F.G.)

47. **Blümcke,** R. — Utilization of the navigation of large but shallow rivers. Vessels and motors. (Germany) (G.E.F.)

48. **Townsend,** C. Mc.D. — Utilization of the navigation of large but shallow rivers. (United States) (E.F.G.)

49. **Rayner,** F. — Utilization of the navigation of large but shallow rivers. Vessels and motors. (Great Britain) (E.F.G.)

51. **Merczyng,** H. C. — The utilization of the navigation of large but shallows rivers. Vessels and motors. (Russia) (F.E.G.)

Second Section. — Ocean Navigation.

A. — QUESTIONS.

First Question. — *Means for docking and repairing vessels.*

52. **Endicott,** M. T. — *General Report.* (United States) (E.F.G.)

53. **Mönch,** H., **von Klitzing,** Ph. and **Hedde,** P. — Docks (Dry docks, Floating docks, Buildings berths, etc.) (Germany) (G.E.F.)

54. **Descans,** L. — Dry docks. (Belgium) (E.F.G.)

55. **Donald,** J. — Means for docking and repairing vessels (United States). (E.F.G.)

56. **Cuiffart,** A. — Graving docks in course of construction in France. (France) (F.E.G.)

57. **Box,** E. — Means for docking and repairing vessels. (Great Britain) (E.F.G.)

58. **Egan,** E. — Means for docking and repairing vessels. The state owned floating dock in the harbour of Fiume. (Hungary) (G.E.F.)

59. **Luiggi,** L. — Slipways. Floating docks and graving docks in Italian harbours. (Italy) (F.E.G.)

60. **Nobel,** C. — The problem of floating docks in Holland and the Dutch Indies. (Netherlands) (F.E.G.)

61. **Treniukhinn,** V. M. — Some notes on the comparative theoretical advantages of docking large ships in dry and floating docks. (Russia) (F.E.G.)

SECOND QUESTION.— *Dimensions to be given to maritime canals. (Technical point of view. Probable dimensions of the sea-going vessels of the future).*

62. **Crunsky,** C. E. — *General Report.* (United States) (E.F.G.)

63. **de Thierry,** G. — Dimensions to be given to maritime canals. Technical point of view. Probable dimensions of the sea-going vessels of the future. (Germany) (G.E.F.)

64. **Vander Vin,** H. — Dimensions to be given to maritime canals. Technical point of view. Probable dimensions of the sea-going vessels of the future. (Belgium) (F.E.G.)

65. **Corthell,** E. L. — Dimensions to be given to maritime canals, taking into account the probable dimensions of ocean ships of the future. (United States) (E.F.G.)

67. **Foster King,** J. — The probable dimensions of sea-going vessels of the future in relation to the dimensions to be given to maritime canals. (Great Britain) (E.F.G.)

68. **Leemans,** C. — Dimensions to be given to maritime canals. Technical point of view. Probable dimensions of the sea-going vessels of the future. (Netherlands) (F.E.G.)

69. **Zamjatin,** E. I. — The growth of the size of sea-going vessels and the deepening of sea canals and ports, at their present stage of development. (Russia) (F.E.G.)

THIRD QUESTION. — *Mechanical equipment of ports.*

70. **Bensel,** J. A. — *General Report.* (United States) (E.F.G.)

71. **Bubendey,** J. F., and **Meyer,** E. G. — Mechanical equipment of ports. (Germany) (G.E.F.)

72. **Hodgdon,** F. W. — Mechanical equipment of ports. (United States) (E.F.G.)

73. **Barrillon,** P.— The mechanical equipment of ports. (France) (F.E.G.)

74. **Barling,** I. C. — Mechanical equipment of ports. (Great Britain) (E.F.G.)

76. **Cool,** W., and **de Kanter,** A. — Mechanical equipment of ports. (Netherlands) **(F.E.G.)**

77. **Spalving,** G. — Mechanical equipment of ports. Considerations on the choice of loading and storing, in ports for the export grain trade. (Russia) (G.E.F.)

78. **Hermann,** A. — On methods of loading phosphates and iron ore at Tunis harbours. (France) (F.E.G.)

B. — COMMUNICATIONS.

FIRST COMMUNICATION. — ***High powered dredges and means for removing rock under water.***

79. **Saunders,** W. L.— *General Report.* (United States) (E.F.G.)

80. **Blümcke,** R. — High-powered dredges. Means for removing rock under water. (Germany) (G.E.F.)

81. **Hernandez,** R. — Removal of rocks below water, in Spain. (Spain) (F.E.G.)

82. **Williamson,** S. B. — High powered dredges and means of removing rock under water. (United States) (E.F.G.)

83. **Vidal,** P. — Very powerful dredges and arrangements for rock removal under water. (France) (F.E.G.)

84. **Koch,** M. — Powerful dredgers; means for the removal of rocks under water. (Hungary) (G.E.F.)

85. **Fossataro,** J. — Dredges of great power and means for rock removal under water. (Italy) (F.E.G.)

86. **de Kanter,** A., and **Wesseling,** H. C. — Dredgers of great power and capacity and apparatus for removing submerged rocks. (Netherlands) (F.E.G.)

88. **Sundblad**, N. K. — Description of the methods employed in Sweden in under-water blasting-operations. (Sweden) (E.F.G.)

SECOND COMMUNICATION. — *Report on the most recent works constructed at the more important sea ports, especially those relating to breakwaters. Applications of reinforced concrete. Means for insuring its preservation.*

89. **Burr,** E. — *General Report.* (United States) (E.F.G.)

90. **The General Government of Algeria.** — Report on the recent and most interesting breakwaters and applications of reinforced concrete in the maritime ports of Algeria. (F.E.G.)

91. **Mönch,** H. — Report on the most recent works constructed at the more important sea ports, and especially on those relating to breakwaters. Applications of reinforced concrete; means for insuring its preservation. (Germany) (G.E.F.)

93. **Bech,** C., **Monberg,** N. C., and **Möller,** H. C. V. — Report on the most recent works constructed at the more important sea ports and especially on those relating to breakwaters. Applications of reinforced concrete; means for insuring its preservation. (Denmark) (E.F.G.)

94. **Hasskarl,** J. F. — Report on the most recent works constructed at the more important sea ports, especially on those relating to breakwaters. Applications of reinforced concrete. Means for insuring its preservation. (United States) (E.F.G.)

95. **Voisin,** J. — Report on the most recent works constructed at the more important sea ports and especially on those relating to breakwaters. Applications of reinforced concrete; means for insuring its preservation. (France) (F.E.G.)

96. **Carey,** A. E. — Recent works at important sea ports and reinforced concrete as applied to this. (Great Britain) (E.F.G.)

97. **Inglese,** I., and **Luiggi,** L. — Works going on for the construction of a new breakwater in the port of Naples. (Italy) (F.E.G.)

98. **de Blocq van Kuffeler.** — Report on the most recent works constructed at the more important sea ports and especially on those relating to breakwaters. Applications of reinforced concrete; means for insuring its preservation. (Netherlands) (F.E.G.)

100. **Lundberg,** A., and **Fellenius,** W. — Report on the recent works in the most important Swedish sea ports. (Sweden) (E.F.G.)

101. **Hermann,** A. — Account of work carried out in the principal sea ports of Tunis. (France) (F.E.G.)

THIRD COMMUNICATION. — *Bridges and ferry bridges; tunnels under waterways used for ocean navigation. Economic and technical study.*

102. **Burr,** W. H. — *General Report.* (United States) (E.F.G.)

103. **Wendemuth.** — Bridges and ferry bridges; tunnels under waterways used for ocean navigation. Economic and technical study. (Germany) (G.E.F.)

104. **Zanen,** F., and **Descans,** L. — Methods of communication between the shores of maritime waterways. (Belgium) (F.E.G.)

105. **Lindenthal,** G. — On the means of crossing wide and deep waterways. (United States) (E.F.G.)

106. **Babin, Coblentz** and **Tartrat.** — Bridges and ferry bridges; tunnels under waterways used for ocean navigation. Economical and technical study. (France) (F.E.G.)

107. **Forti,** A. — Bridges, ferry bridges, tunnels under waterways used for ocean navigation. (Italy) (F.E.G.)

108. **Rojdestvensky,** A. — Bridges and ferry bridges. Tunnels under waterways used for ocean navigation. Economic and technical study. (Russia) (F.E.G.)

109. **Nilsson,** E. J. — Bridges and ferry bridges. Tunnels under waterways used for ocean navigation. Economic and technical study. (Sweden) (G.E.F.)

FOURTH COMMUNICATION. — *Safety of navigation. Lighted buoys.*

110. **Putnam,** G. R. — *General Report.* (United States) (E.F.G.)

111. **Braun.** — Lighted buoys on the Prussian coasts. (Germany) (G.E.F.)

112. **Millis,** J. — Safety of navigation on the great American lakes. (United States) (E.F.G.)

113. **de Joly,** G. — Safety of navigation. Lighted buoys. (France) (F.E.G.)

114. **Stevenson,** D. A. — Lighted buoys as aids to navigation (Great Britain) (E.F.G.)

116. **van Braam van Vloten,** P. — Communication on the lighting of the Dutch coasts. (Netherlands) (F.E.G.)

117. **de Schokalsky,** J. — Safety of open sea navigation. (Russia) (F.E.G.)

118. **Grönvall,** U. — New methods for the automatic lighting of lighthouses, lightships and light-buoys in Sweden. (Sweden) (F.E.G.)

VARIOUS PUBLICATIONS :

Publications of the Organizing Commission.

119. Philadelphia and vicinity. (E.)
120. The great lakes of North America and the Far West. (E.)

121. The port and city of Philadelphia. (E.F.G.)
122. Pensylvania and its manifold industries (E.F.G.)
123. Monthly Bulletins : December-January-February-March-April. (E.F.G.)
124. Journal of the Congress: N^os 1, 2, 3, 4, 5, 6, 7. (E.)
125. Technical program of the Congress. (E.F.G.)
126. General program of disposition of the time. (E.F.G.)
127. List of persons to whom Congress Cards of Membership have been issued. (E.F.G.)

Publications of various administrations and corporations.

128. Relief Map of the Panama Canal.
129. Relief Map of the United States.
130. The New York State Barge Canal. (E.)
131. Duluth and the Iron Ranges of Minnesota. (E.)
132. Canada: her natural resources, Navigation, principal steamer Lines, and transcontinental Railways. Issued by the Department of Marine and Fisheries, Ottawa. (E.)
133. The New York Improvement and Tunnel Extension of the Pennsylvania Railroad. (E.)
134. Notes on the improvement of the harbors and connecting waters of the Great Lakes, by Colonel C. McD. Townsend, Corps of Engineers, U. S. A. (E.)
135. Synopsis of Flood Commission Report, Pittsburgh, 1912. (E.)
136. Report of Connecticut Rivers and Harbors Commission, 1910. (E.)
137. Official handbook of the Panama Canal. (E.)
138. Report accompanying general description of the Harbor of New York. (E.)
139. Barge Canal Bulletin, June, 1910. (E.)
140. Anchorage Regulations, Harbor of Philadelphia. (E.)
141. Trip of Inspection around New York Harbor. General plan and description. (E.)
142. The port of Boston. (E.)
143. Boston (Booklet of illustrations). (E.F.G.)
144. Map of Boston Harbor.

145. Boston Harbor inspection trip. (E.)
146. Several pamphlets descriptive of the Cape Cod Canal. (E.)
147. Map of the "Great Lakes" and the eastern States, entitled "Summer excursion Routes, Pennsylvania Railroad System".
148. Cleveland Harbor problem (lecture by Col. John Millis, Corps of Engineers, U. S. Army). (E.)
149. Report upon the improvement of rivers and harbors in the Cleveland, Ohio, district, by John Millis, Colonel, Corps of Engineers, U. S. Army, in charge, 1911. (E.)
150. Cleveland Marine Review, June issue, 1912.
151. The Great Lakes. Lecture by M. Harvey D. Goulder, of Cleveland. (E.)
152. Excursion, Fourth Avenue subway, Brooklyn, N. Y., June 5, 1912. Bradley Contracting C°, Contractors. (E.)
153. Engineers' Report on the Intra-Coastal Waterway, Boston. Mass. to Beaufort, N. C. (E.)
154. New Jersey, Notice. (E.F.G.)
155. Preliminary Report of the New Jersey ship-canal Commission. (E.)
156. Bulletin, Atlantic deeper waterways Association. May, 1912. (E.)
157. Map of Hudson River, New York to Albany.
157a. Buffalo Harbor, N. Y. Breakwater. (E.)
158. St. Mary's falls Canal, Michigan. Statistical Report of Lake Commerce, prepared under the direction of Colonel C. McD. Townsend, Corps of Engineers, U. S. Army. (E.)
159. Pennsylvania Railroad, Guide to Washington. (E.F.G.)
160. The Détroiter, Spokesman of Optimism, published by the Detroit Board of Commerce. (E.)
161. Gray's aero view of the Panama Canal. (E.)
162. Submarine signalling. (E.F.G.)
163. American gas-accumulator C°. Automatic buoys, Beacons and Lighting equipment for Lighthouses and Light vessels. (E.)
164. Carnegie Steel C°, Pittsburgh, Pa. Notice. (E.)
165. The Erie Michigan Canal. Prelimmary data and profiles along the various proposed routes, by Wm. E. Harris. (E.)

166. Annual report of the State Engineer and Surveyor of the State of New York, Albany, 1912. (E.)
167. Westinghouse views. (E.)
168. Map of St. Laurence River. Montreal and Quebec. (E.)
169. Lockport. Electrical and Industrial. (E.)
170. Trenton. Historical and Industrial. (E.)
171. Old Company's Lehigh. (E.)
172. Descriptive itinerary of trip to South Bethlehem and the Anthracite Coal Regions. (E.)
173. Manual of Steam-shovel Work. (E.)
174. The XIIth International Congress of Navigation, 1912. Presentation number of the New York Maritime Register. (E.)
175. Itinerary-Philadelphia to Chicago. (E.F.G.)
176. Tour to Washington, Harrisburg and Pittsburg. (E.F.G.)
177. New System of Construction for Dikes and Breakwaters, by Jose M. Fuster. (E.)
178. Statement of rank, duties and adresses of officers of the Corps of Engineers, U. S. Army. (E.)
179. Saint Paul, 1909-1910. (E.F.G.)
180. Albany. Report by the Chamber of Commerce of Albany. N.T. (E.)
181. The Challenge of the Mountains, Canadian Pacific Railway. (E.)
182. Through Wonderland, Yellowstone National Park (Northern Pacific). (E.)
183. Where gush the Geysers.- Yellowstone National Park (Union Pacific). (E.)
184. Works at the port of Bizerta and the arsenal of Sidi-Abdallah, by Mr. J. Hersent, civil engineer. (F.)
185. Aga aids to navigation. (E.)
186. Applications of reinforced concrete to hydraulic works, by Juan Manuel de Zafra. Engineer. Professor. (E.F.)
187. Lisbon and Portugal.
188. Deutsche Schiffahrt-Sonderausgabe, Mai, 10, 1912. (G.)

Publications of the Permanent International Association of Navigation Congresses.

189. Summary of the proceedings of the XIIth International Navigation Congress, Brussels, 1912. (E.F.G.).

190. Report of the proceedings of the XIIth Congress. Brussels, 1912. (E.F.G.)

Publication by the Ministry of Public Works of France.

191. *Report of the French delegates on the proceedings of the XIIth Congress.* — Ministry of Public Works. — Paris. A. Dumas. Editor. 1914.

CONCLUSIONS

ADOPTED BY THE XII[th] CONGRESS

FIRST SECTION

INLAND NAVIGATION

FIRST QUESTION. — **Improvement of rivers by regulation and dredging and, if needs be, by reservoirs. Determination of the case in which it is preferable to resort to such works rather than to canalization or the construction of a lateral canal.**

CONCLUSIONS ADOPTED :

1. *Absence of any exclusive method.* — The navigability of rivers having but one current can be improved, as it has been stated many times at the Navigation Congresses, by various methods, such as: Regulation of the bed by permanent works; regulation of the bed by mechanical dredging; increase of depth by an additional water supply furnished by storage reservoirs; canalization of the bed; combined action of the two or more of above processes; construction of a lateral canal. The use of one of these methods rather than another depends upon the special circumstances of each particular case. Among these circumstances, the following are of prime importance : The nature of the river and of its navigation; the existence of objects of improvement other than that of navigability (more especially agricultural, power or sanitary purposes; protection of the banks in the interest of towns, protection against inundations), the degree of the navigability required, the importance of the expected traffic, the resulting cost of transportation, including interest on the cost of improvement, maintenance charges and the cost of carriage, money and time available to insure, for the

boating industry on the line in question, the conditions of navigability sought, etc.

2. *The impossibility of establishing, at the present time, fixed rules determining a priori the method which has to be preferred in any given case.* — While stating that the different methods used for improvement of river navigability have given satisfactory results and reached their purposes under special conditions, in which they have been applied, the Congress finds, that it would be premature to try to establish at the present time fixed rules determining a priori, the method to be preferred in any given case, inasmuch as the classification of rivers from the standpoint of their nature and of their navigation is yet to be accomplished.

3. *Necessities for Studies.* — If there be no general method for improving the navigability of rivers which is applicable to all rivers, and if the selection to be made be always governed by circumstances and remains a question of kind, each process can be perfected and made more suitable for rivers of a certain regimen. This makes it desirable:

a) That scientifically organized special studies be undertaken, by sundry nations, on rivers with different regimens, in order to observe the degree of navigability which it is possible to attain by the applications of various methods of improvement, and to determine the factors which govern the cost of the corresponding works;

b) That hydrotechnic laboratories intended for the study, on small scale models, of the life of rivers become of more and more extended use and that they be supplied with the means necessary to experiment with the various processes for improving the navigability of rivers and, in so far as possible, in connection with the studies and works carried out on the rivers themselves;

c) That the resolution of the Sixth Congress of Inland Navigation, voted at The Hague in 1894, be carried into effect, this resolution calling for taking up, in connection with rivers having but one current, the study of a short, clear formulary, which shall be sufficiently complete and include the information necessary to define the characteristics of every river studied,

from the double point of view of its regimen and its navigation;

d) That the improvement of the navigability of rivers having but one current, completed by those of the laboratory experiments and of the formulary, be kept on the order of business of the next Congress of Navigation.

SECOND QUESTION. — **Dimensions to be assigned, in any given country, to canals for heavy traffic. Principles of operating. Dimensions and equipment of the locks.**

CONCLUSIONS ADOPTED:

1. Standard dimensions for interconnecting canals, permitting interchange of traffic without trans-shipment, are desirable.

2. Practical harbor and trans-shipment facilities and the rapid circulation of the means of transport are as important for the economy of transportation as are fixed dimensions of canals and boats.

3. The waterway and its boats should receive progressively the improvements needed in order to continue to serve the traffic which it develops.

4. It is desirable in order to develop the traffic on the canals to employ trains of boats, towed by tugs or self-propelling boats. If the traffic becomes very important, special attention should be paid to regulating the movement of the boats.

5. For an important traffic, it is desirable to operate the locks with mechanical appliances. Special attention should be paid to facilitating the entrance and the exit of boats.

THIRD QUESTION. — **Intermediate and terminal ports. Best methods for combining, facilitating and harmonizing the transfer of freight between waterways and railways.**

CONCLUSIONS ADOPTED:

1. The problem of combining, facilitating and harmonizing the transfer of freight between waterways and railways is partly administrative or governmental, and partly technical or mechanical.

The co-operation of railroads with waterways should be secured by the effective regulation of railroad services by national, state and local governments. The legislative and administrative requirements of the several public authorities should so supplement each other as to make a unified transportation system of the railroads and waterways in each country.

2. It is essential that each port should be systematically organised for the accommodation of the traffic and the industries to be served. Experience conclusively shows the need of supplementing the use of privately developed terminals, by the public ownership or control of the operation of wharves, docks, warehouses, and other harbor facilities for handling freights for public use. Exclusive private ownership of water terminals is indefensible.

3. The legislative and administrative measures to be taken to co-ordinate railroads and waterways, to unify and systematize port facilities, and to provide an efficient harbor administration must vary with different countries.

4. The layout of intermediate and terminal ports and the mechanical appliances best adapted to the handling of traffic must be determined for each port separately and in accordance with its special requirements. Local city and state engineers must apply to the solution of local problems, and adapt to local conditions, the principles of port organization and operation that have been found effective at other ports and in other countries.

SECOND SECTION

OCEAN NAVIGATION

FIRST QUESTION. — **Means for docking and repairing vessels.**

CONCLUSIONS ADOPTED:

Graving docks constitue, in general, the most satisfactory solution of the problem of docking large vessels; but there are

cases where floating docks only could be adopted, and others where they offer special advantages that give them the preference.

SECOND QUESTION. — **Dimensions to be given to maritime canals. (Technical point of view. Probable dimensions of the sea-going vessels of the future.)**

CONCLUSIONS:

In a maritime canal a wet section 5 times as large as the immersed portion of the largest ship which is to use the canal is desirable, as also a depth of one meter under the keel ; but these values are functions of the speed at which the canal is to be navigated and therefore to some extent also of the volume of commerce, and are to be determined by local conditions.

THIRD QUESTION. — **Mechanical equipment of ports.**

CONCLUSIONS:

The Section recommends that the following question should be placed on the program of the next Congress:

Mechanical transferring of miscellaneous cargoes from the vessel's hold or from the vessel's deck or from the pier's side to all areas embraced within the terminal limits.

GENERAL RECAPITULATION

OF THE

PROGRAMMES OF THE PROCEEDINGS

OF THE

XII INTERNATIONAL NAVIGATION CONGRESSES

Ist Congress — Brussels 1885

QUESTIONS.

First Question. — **What are the conditions necessary for a ship canal to be of value, in other words, for the advantages obtainable to be sufficient to compensate the expense entailed in the construction and maintenance of the canal?**

(The term canal is used in a general sense and is applicable to rivers whose course has been so improved as to allow of navigation).

Second Question. — **Is it desirable that all inland canals should belong to the State?**

Third Question. — **Is it adviseable to apply to all inland canals the principle of freedom from tolls, such as exists on the Lake Erie canal and the canals belonging to the French Government?**

Fourth Question. — **Does the cost of construction of a canal in a given subsoil increase in proportion to the area of its cross section? What types of canal should be adopted?**

Fifth Question. — **Which are the best machines in use for canal construction?**

Sixth Question. — **Which are the best methods of construction for the retaining walls of wharves and docks?**

Seventh Question. — **What are the best means for consolidating the banks so as to allow operating at high speed.**

Eighth Question. — **Which are the different systems of working canals, more especially from the point of view of traction?**

Ninth Question. — a) **What are the advantages of the different systems of locks?** — b) **What is the greatest allowable lift?** — c) **What are the advantages of locks set side by side?**

IInd Congress — Vienna 1886

FIRST SECTION

First Question. — **The study of waterways from the economic point.**

Cost of freight on inland waterways compared with cost on rail — advantages and disadvantages of transport on each of the above systems — influence of cold weather and the slowness of circulation on transport by water — transport by water of raw materials, of heavy goods, etc., — influence of fiscal tarifs on the increase of existing traffic and the development of new branches of traffic — construction of new artificial waterways — suggestions.

SECOND SECTION

Second Question. — **Normal profiles of canals and dimensions of structures pertaining to artificial lines of inland navigation.**

Statistics of the dimensions of inland waterways — their advantages and disadvantages — main and intermediary waterways — importance of a uniform type — suggestions.

THIRD SECTION

THIRD QUESTION. — **The methods of operating navigable highways.**

Present organisation and possible improvements — monopoly versus free choice of method of towing — suggestions.

FOURTH SECTION

FOURTH QUESTION. — **The construction of ship-canals. — Their utility.**

Historical — new schemes — suggestions.

III[rd] Congress — Frankfort on Main 1888

FIRST QUESTION. — **Revision of the statistics relating to inland navigation.**

SECOND QUESTION. — **Improvements in the navigability of rivers.**

THIRD QUESTION. — **Which are the vessels and methods of traction best suited to the conditions of the great navigable highways?**

FOURTH QUESTION. — **What are the economic advantages of ship-canals which penetrate into the interior of a country?**

FIFTH QUESTION. — **The utility of canalising rivers and the construction of waterways, from the point of view of agriculture.**

SIXTH QUESTION. — **The estuaries of rivers, their suitability for navigation, and their maintenance.**

IV^th Congress — Manchester 1890

FIRST SECTION

Works entailed and management.

First Question. — **Inland rivers and canals.**

Description of the various systems of waterways; methods of traction and propulsion on canals; methods of strengthning the banks of waterways.

Second Question. — **1. Tidal Rivers. Improvement of estuaries and rivers-mouths. — 2. Ship-canals.**

SECOND SECTION

Commercial and Economic questions.

Third Question. — **Statistics concerning inland navigation.**

Consideration of the report of the International Statistical Committee appointed by the III^rd Congress of Inland Navigation at its meeting at Frankfort on Main. 1888.

Fourth Question. — **Présent position, system of management and working costs of canals.**

V^th Congress — Paris 1892

FIRST SECTION

Construction and maintenance of waterways.

First Question. — **Consolidation of canal banks.**

Means employed for consolidating canal banks in view of navigation at high speed. Results obtained. Cost. Influence of the width of waterways.

SECOND QUESTION. — **Water consumption in canals. Its different elements. Variations of it with increase of depth.**

Different methods for procuring feeding resources : Springs, brooks, perennial-sources, reservoirs, machinery for raising water. Cost of water per cubic metre. Advantages and disadvantages of each of the methods.

THIRD QUESTION. — **Leakage in canals.**

Different means of rendering canals water-tight; with sand, clay, layers of puddled clay, concrete. Cost of various methods; their efficacity, advantages and disadvantages.

FOURTH QUESTION. — **Reservoirs.**

Various types of reservoirs. Their methods of construction, by means of earth banks or masonry walls. Height and cross section of dams. Foundations. Method of execution of the work. Other works in connection with reservoirs; overflow basins, water catchments, drainers.

Special technical and working conditions attaching to reservoirs constructed to cope with various requirements. Disadvantages and advantages of using the same reservoir for feeding canals, irrigation purposes and factory supply.

SECOND SECTION

Technical Management.

FIFTH QUESTION. — **Stoppages on canals and canalized rivers.**

Stoppages caused to vessels by the carrying out of maintenance work in canals and canalized rivers along the line of the channel itself.

Usual date and duration of such stoppages. Circumstances which govern the period at which the work takes place; difficulties of filling the reaches; necessity for making arrangements for fair and market times; periods during which traffic on the canals is most dense.

Simultaneous and successive stoppages. Is it possible to fix on a uniform date for the commencement of the stoppage on all branches of the canal system, if not, what are the principles on which the succession of repairs in carried out.

Technical or working methods to be employed in order to reduce the length of the stoppage as much as possible.

SIXTH QUESTION. — **Traction on canals. — Traction on canalized rivers. — Traction on rivers of natural flow.**

Various systems of traction in use on each of the types of canal under consideration. Relationship between the system of traction and the type of waterways, viz .

1. *Technical considerations: Dimensions of the navigable channel, shape, state of the banks, currents, rise and fall of tide, stoppages, vessels and materials, to be hauled, etc. Under what circumstances and limitations should the passage through of water intended for irrigation or factory purposes be allowed. Technical and financial examination of the question.*

2. *Working conditions; whether the traction plant should or should not be under the same ownership as the transport plant and the waterway; the loading and discharging plant of the ports must be taken into consideration, also the time lost, either as lay days or for other reasons, and the means of communication with neighbouring waterways.*

3. *Administrative conditions : police regulations and the terms of concessions often impose conditions which react on the system of traction.*

Data regarding the economic results realised.

THIRD SECTION

Commercial working and economic questions.

SEVENTH QUESTION. — **Taxes and tolls on navigable waterways.**

Taxes or tolls charged by the State on waterways managed by the Government. Description of the character of the tolls. Whether they simply form a tax on transport coming under the same head as any other tax in the budget? Is the sum received from such taxes or tolls specially set aside for the maintenance of waterways, for the carrying out of new works or improvements?

What form do these tolls take and what is the amount obtained thereform?

Is there a special amount set aside for the expenses of working moveable structures such as locks, barriers, and swing bridges by day and night?

What reasons can justify the retention of such tolls, or can be urged in favour of their suppression in such countries as they exist in?

EIGHTH QUESTION. — **Conditions of administrations of inland ports.**

Conditions of administration governing the inland ports from the point of view of their construction, maintenance and management. The extent of their loading and unloading plant. Under what conditions is this plant available to the public? Linking up of the inland ports by means of railroads with the main lines of railway.

NINTH QUESTION. — **Respective roles of waterways and railways in the transport industry.**

Definition of the respective roles of waterways and railways in the transport industry. Definition of the various kinds of traffic which pertain to each of these systems. Examination of the circumstances under which they come into competition and those under which they assist each other. Distinction between parallel routes and routes at right angles.

Consequences of the proximity of two routes, particularly from the point of view of the railway, also from the general point of view of the district they serve.

FOURTH SECTION

Improvements obtainable in rivers in the portions used by shipping.

TENTH QUESTION. — **Improvements obtainable in rivers in the portions used by shipping, including their estuaries.**

Upper reaches of the river; amount of fresh water flow at dead low-water, at ordinary times, and in times of flood. Nature and amount of the matter carried down by the stream. Lower reaches of the river; chart, tide, winds, currents. Nature and amount of the marine deposits — map of the river; longitudinal section, cross-section. Nature of the sides of the centre channel; bars and shallows; their mouvement. Tides and currents in the river. Amount of tide-water. Works carried out : improvement of the main stream, embankments, dredging. Their resulting effect on the action of the river and on navigation.

VIth Congress — The Hague 1894

FIRST SECTION

Construction and maintenance of canals and ports.

FIRST QUESTION. — **Construction of navigation canals affording operation at high speed.**

Forms and dimensions of the canal section which will permit a boat of a given immersed section to attain a desired speed with the least tractional effort. Necessary excess depth of the canal over draught of boats. Minimum radius to be adopted for canal curves. The most efficacious disposition and most economical construction for the protection of slopes and bermes.

SECOND QUESTION. — **Plant of ports of navigation.**

Different systems of plant for ports. Advantages and disadvantages of these systems. Operating conditions. Economic results. Better arrangement of the connections between the railroads and the ports.

SECOND SECTION

Technical Treatment.

THIRD QUESTION. — **Means for preventing ice blockades.**

Different systems and methods of breaking and removing ice. Ice-breaking boats, explosive materials, etc. Results obtained. Price of construction of necessary apparatus. Expenses of operation.

FOURTH QUESTION. — **Traction and propulsion upon canals, canalized rivers, and rivers of natural flow.**

Progress made since the preceding congress in the application of various systems of boat traction and propulsion. New systems invented or applied since then. Influence of the shape of boats and the condition of their surface on traction resistance. Speed necessary and attainable for cargo boats as for steamers and tugs with their tows.

THIRD SECTION

Commercial treatment and economic questions.

FIFTH QUESTION. — **Tolls on navigable ways.**

Rates of tolls; influence of mileage; of the tonnage of boats; of the nature, value and quantity of goods transported. Classification of freights Exemption from, or moderation of, tolls on boats returning empty. Method of collection. Control. Additional tolls for movement of locks, dams and bridges. Special extra charge for night service.

FOURTH SECTION

Navigable rivers and their improvement.

SIXTH QUESTION. — **Relations between the configuration of rivers and the depths of their channels.**

Comparative study of the forms and depths of the principal water-courses, tidal and non-tidal, and with variable bottoms, with respect to the following points : Correlation between curvature and depth; distance between points of greatest and least curvature and corresponding points of greatest and least depth (law of deflection). Application of the experimental graphic method based upon synoptic diagrams of curves and depths. Influence of width and discharge of rivers on the least depth, in cases where curves are nearly equal. Influence of a form consisting of straight lines and arcs of circles compared with that constructed upon Mr. Fargue's system. Influence of high and low water on the channel depth in curve. Maximum sinuosity compatible with a continuous channel for different discharges and widths. Practical rules to be adopted for the choice of form and constitution of a low-water channel for non-tidal and tidal rivers.

SEVENTH QUESTION. — **Regulation of rivers at low-water.**

Influence exerted upon the current of a river by continuous longitudinal dykes constructed so that at low water they enclose the entire river and remain slightly submerged. Possibility of regulating rivers by means of works designed to employ the total discharge in favour of navigation at low-water.

VIIth Congress — Brussels 1898

FIRST SECTION

Canalized Rivers.

First Question. — **Raising of existing weirs.**

Means to be employed for executing the work in order to hinder navigation as little as possible and to curtail the cost of transforming the retaining apparatus.

Second Question. — **Consolidation of weir foundations.**

Work intended to prevent the water from passing underneath the foundations, so as to reduce the expense of maintenance of works; means of execution to be employed in order to hinder navigation as little as possible.

Third Question. — **Utilization of the fall of water at weirs as a motive power.**

Means of utilizing such power at ordinary times for the traction of boats and for work to be performed in the interest of navigation. Utilizing the swiftness of the stream during the high waters.

Fourth Question. — **Resistance to the movement of boats.**

Influence of the shape of boats and the condition of their surface on the tractional resistance

SECOND SECTION

Inland navigation canals.

Fipst Question. — **Modes of mechanical traction along canals.**

Improvements realised or proposed since the Congress held at The Hague.

Second Question. — **Single lock-gates.**

Lifting, rolling, pivoting or turning down gates.

THIRD QUESTION. — **Means of securing the water-tightness of the bed and banks of a canal.**

Lay down precisely and completely the means suggested at the Paris Congress of 1892 in answer to the third question submitted to that congress, viz « Water-tightness of canals. »

FOURTH QUESTION. — **Mechanical lifting from reach to reach of water supplying a canal.**

Means of transmitting directly or at a distance the power required for lifting the water from reach to reach. Steam engines electricity, water pressure, etc.

THIRD SECTION

Tidal rivers and ship canals.

FIRST QUESTION. — **Formulary of characteristic particulars about a tidal river.**

A. *Enumerate in detail the particulars to be collected in order to characterize a river and to be able to compare the regime and conditions of navigableness thereof with those of another river.*

Explain the meaning and value of the terms used, so as to secure bases of comparison applicable to the various rivers.

B. *Furnish in respect of one or more rivers the enumeration of the particulars referred to above.*

SECOND QUESTION. — **Modes of cubature of tidal volumes.**

Submit and compare the analyses of graphical methods capable of determining, for any given section of a river, the tidal volumes at any moment.

THIRD QUESTION. — **Means of consolidation of ship-canal banks.**

Complete the information furnished at preceding Congresses and relate experiments effected, dwelling upon the nature of the soil and conditions of navigation (speed, extent of trafic, mode of propelling, relation between the sections of the canal and boat below the water-level, etc.)

Outlay for first establishment and expense of keeping in repair.

FOURTH QUESTION. — **Dredging.**

Latest high-power dredgers contrivances, in what cases used, produces, unitary prices.

FOURTH SECTION

Seaports.

FIRST QUESTION. — **Warehouses and sheds.**

Accomodation, size, mode of construction, means of access.

SECOND QUESTION. — **Relative surfaces of the different parts of a seaport.**

Docks, quays, railways, warehouses and sheds, ground reserved for commerce and industry.

THIRD QUESTION. — **Free ports.**

Reasons therefor and conditions of establishment, installations, dimensions.

FOURTH QUESTION. — **Single lock-gates.**

Contrivances recently devised.

FIFTH SECTION

Tolls, dues and local charges.

FIRST QUESTION. — **Maritime tolls, dues and local charges. Mode of collection.**

Collection per ton capacity or per ton weight. Nature and amount of local charges.

SECOND QUESTION. — **Unification of the measurement system of boats for inland navigation.**

Position of the matter.

VIIIth Congress — Paris 1900

FIRST SECTION

Inland Navigation : Works entailed.

First Question. — **Influence of training works on the regime of streams and rivers.**

Show more especially the influence such works have in times of flood.

Second Question. — **Progress in mechanical methods of supplying water to canals.**

Additional Question. — **Prevention of stoppages.**

SECOND SECTION

Inland Navigation : Management.

Third Question. — **Utilization of natural navigable waterways of slight depth beyond their maritime portion.**

Methods of administration, and shallow draft plant more especially available for colonial use.

Fourth Question. —**Progress of the application of machinery to traction on waterways. Monopoly of traction rights.**

Fifth Question. — **Provident and instructional institutions for the working staff of inland and raft navigation.**

THIRD SECTION

Maritime Navigation : Works entailed.

Sixth Question. — **The most recent progress of lighthouses and beacons.**

Seventh Question. — **The most recent works at some of the principal seaports and harbours.**

FOURTH SECTION

Maritime Navigation : Administration.

EIGHTH QUESTION. — **On the adaptation of harbours to the requirements of modern mercantile shipping.**

NINTH QUESTION. — **Improvements in mechanical appliances for the working plant of ports.**

IX^th Congress – Düsseldorf 1902

FIRST SECTION

Inland Navigation.

A. — QUESTIONS.

FIRST QUESTION. — **Surmounting of great ascents.**

Discussion of the technical and economic values of the most appropriate methods of surmounting great differences of level with a view to constructing an artificial waterway.

Papers may be sent in treating the question as a whole, or dealing with certain portions of the subject only, more especially with inclined planes, vertical lifts and locks with a great fall. The possibility of constructing tunnels and the necessity for procuring a water-supply may be taken as coming within the scope of the general discussion.

SECOND QUESTION. — **Ship Tolls.**

Discussion from the economic and financial point of view. A critique of the following questions is particularly desirable :

a) *Is it possible by the charging of ship-dues on inland waterways and at inland ports to cover the working expenses and maintenance cost, and to gradually pay off the original installation expense?*

b) *How far has this goal been attempted and attained?*

c) *What circumstances have assisted or prevented the attaining of the desired result?*

d) *How far and in what cases has the result been obtained owing*

to the societies working the inland waterway having themselves undertaken:

1° *The haulage of vessels?*

2° *The entire work of management of the system of navigation, (which system has been at the disposal of the traffic), at a given rate?*

e) *Which of the expenses of construction as regards the installation and improvement of waterways, should not be included in the calculation of the shipping dues, owing to the fact that the sum of this expenditure has not been expended on navigation.*

THIRD QUESTION. — **Depreciation of coal and coke through transport by water.**

Show what are the principal agencies causing depreciation in the value of coal and coke when carried by water, when loaded or unloaded, when stored for a long time; the importance of the amount of damage caused should be estimated, and suggestions made as to means for remedying this state of affairs, such as tipping apparatus, etc. It is also adviseable to take into account the means to be adopted so as to avoid or indirectly diminish these drawbacks, for example, by the consumption of small coal, by the production of coke at the spot where it is to be used instead of at the pit's mouth, etc., and also to determine so far as is possible the depreciation in value of coal and coke when carried by rail.

B. — COMMUNICATIONS.

FIRST COMMUNICATION. — **The installation of reservoir-dams.**

Discussion from an economic and technical point of view of the installation of reservoir-dams, including the Nile dams, the object of which is to allow, by increasing the reserve supply of water, of raising the low-water level of navigable rivers, without going into the question of construction.

SECOND COMMUNICATION. — **Improvements in mechanical haulage on canals.**

THIRD COMMUNICATION. — **River boats with a draught of less than 0.75 m. (about 29 inches. Eng:) of water.**

River boats with a draught of less than 29 inches, and the experience acquired as to the use of turbines and screws for the naviga-

tion of shallow rivers, in accordance with the resolution adopted by the VIIIth Congress as regards Question 3.

FOURTH COMMUNICATION. — **Utilisation of hydraulic power available at the weirs of canalized rivers, and in times of flood, for the mechanical (and electrical) haulage of vessels.**

FIFTH COMMUNICATION. **Recent experiments regarding the tractional resistance of vessels, especially on canals.**

SIXTH COMMUNICATION. — **New ports on the Bavarian Rhine.**

SEVENTH COMMUNICATION. — **The port of Crefeld on the Rhine.**

EIGHTH COMMUNICATION. — **Hydrographic work in Prussia and North-Germany.**

NINTH COMMUNICATION. — **Junctions of inland navigation.**

TENTH COMMUNICATION. — **Dams fitted with rollers.**

ELEVENTH COMMUNICATION. — **Austrian waterways.**

TWELFTH COMMUNICATION. — **The water-supply of Austrian Canals.**

THIRTEENTH COMMUNICATION. — **Electrical installations on Russian waterways and at ports, from an economic and technical point of view.**

FOURTEENTH COMMUNICATION. — **Correction of the course of the « Hunte » below the town of Oldenburg.**

FIFTEENTH COMMUNICATION. — **On the motion of water in a current.**

SIXTEENTH COMMUNICATION. — **On the use of steam-vessels in shallow waters.**

SECOND SECTION

Ocean Navigation.

A. — QUESTIONS.

FIRST QUESTION. — **Costs of construction and maintenance of iron and wooden lock gates.**

Taking into consideration the life, ease of repair, of maintenance, of rigging and of unrigging.

SECOND QUESTION. — **Sea-lighter trade.**

The discussion of the following questions is requested :

a) *What is the extent of the sea-going barge and lighter trade? Treat specially the barge-traffic capable of navigating both on rivers and canals opening on the sea.*

b) *Methods of construction and working most appropriate to sea-going barges, also the expenses and freight-charges pertaining thereto.*

c) *What are the advantages and disadvantages from the point of view of public and economic interest, attaching to sea-going barge traffic.*

d) *Under what circumstances may we expect the greatest advantages from, and what are the economic limits of employment of sea-going lighters, which can also navigate rivers and canals, in competition with inland traffic properly so-called, and the inland and maritime traffic comprising the lighterage system in sea-ports.*

e) *What are the duties of the Government as regards the development of the sea-going barge trade ,calculation of dues, etc...?)*

THIRD QUESTION. — **Dock accomodation.**

Construction and working of docks, floating docks and slips for the maintenance and repair of large modern ships. Their practical use and economic convenience.

B. — COMMUNICATIONS.

FIRST COMMUNICATION. — **Dredging of maritime harbours.**

Specially as regards the maintenance of depth of the channel at the entrance of Ostend Harbour.

SECOND COMMUNICATION. — **Protection of lighthouses.**

Protection of lighthouses and other such maritime signals, from the detriment caused to their working by private installations.

A review of actual cases demanding legal protection is desired, as well as of the present legal status of this matter, and of the attempts which have been made up to the present to extend the protection afforded by law.

THIRD COMMUNICATION. — **Method of construction, results obtainable and cost of working of spoon and toothed dredgers.**

FOURTH COMMUNICATION. — **Progress in maritime signalling.**

FIFTH COMMUNICATION. — **Recent experiments on the tractional resistance of vessels in the open sea.**

SIXTH COMMUNICATION. — **Dredging work carried out in the ship-canal of St. Petersbourg and its ports.**

SEVENTH COMMUNICATION. — **Ship-canals at the mouths of the Dnieper and Bug rivers.**

EIGHTH COMMUNICATION. — **The « Emperor William » canal. Traffic experiences and results.**

NINTH COMMUNICATION. — **Ports of the western coast of Portugal.**

TENTH COMMUNICATION. — **The construction of a harbour in the bay of Monaco.**

ELEVENTH COMMUNICATION. — **Automatic removal of ocean bars by application of natural forces.**

X^th Congress — Milan 1905

FIRST SECTION

Inland Navigation.

A. — QUESTIONS.

First Question. — **On the advantages and organization of mixed transports, that is by railways and waterways.**

Second Question. — **Influence of deforestation and of the drying up of marshes on the sphere of influence and on the performance of the rivers.**

Third Question. — **Investigation of the methods best suited for surmounting great differences of level between the reaches of canals.**

Fourth Question. — **Development of inland navigation by means of shallow-draught vessels. Mode of construction of these, and their motor.**

B. — COMMUNICATIONS.

First Communication. — **A Study of the means of establishing connection, by inland waterway across the Alps, between the Mediterranean, the Adriatic and Central Europe.**

Second Communication. — **Economical and technical study of the mechanical traction of boats on rivers, canals and lakes.**

Third Communication. — **The mortgaging of inland shipping.**

Fourth Communication. — **Have the rivers flowing southward from the Alps the characteristics, and are their hydraulic conditions such, as to render possible the institution of movable dams like those in use on northern rivers to prevent the fall of the water level with the ebbing tide, and to provide the necessary anchoring ground for shipping.**

FIFTH COMMUNICATION. — **Study of the effects produced by the cutting of navigable canals on underground water systems.**

SIXTH COMMUNICATION. — **Results obtained by dredging in increasing the depth of water of rivers. Technical and administrative organization of works undertaken with this object.**

SECOND SECTION

Ocean Navigation.

A. — QUESTIONS.

FIRST QUESTION. — **Improvement of the mouths of rivers discharging into tideless seas.**

SECOND QUESTION. — **Progress in methods of propulsion of vessels. Effect of these on channels and harbours.**

THIRD QUESTION. — **Review of the various methods of working and administration of seaports. Their influence on the development of trade.**

FOURTH QUESTION. — **Conditions affecting the force of waves and the construction of breakwaters to resist them.**

B. — COMMUNICATIONS.

FIRST COMMUNICATION. — **Rapid increase in the dimensions of steamers and sailing vessels. Their draught of water of these. Effects of the increase on the harbours, canals and approaches.**

SECOND COMMUNICATION. — **The use of liquid fuel for purposes of navigation.**

THIRD COMMUNICATION. — **The transport of cargo by ferry-boats.**

FOURTH COMMUNICATION. — **Report on the most recent works carried out in the principal seaports.**

Fifth Communication. — **Responsibility of ship owners in regard to private parties or public administrations.**

Sixth Communication. — **Coast signals. — Lightships. — Wireless telegraphy.**

Seventh Communication. — **Measures adopted by the different governments for the protection of ocean navigation. Bounties. Reduced railway tariffs for merchandise intended to be transported by sea.**

XI^th Congress — St-Petersburg 1908

FIRST SECTION

Inland Navigation.

A. — QUESTIONS.

First Question. — **Arrangement to be given to weirs in rivers having great variations of discharge and occasionally carrying down large quantities of ice, so as to serve the interests of navigation and industry.**

Second Question. — **Study of the economic and technical conditions of the working arrangements and mechanical traction of boats on rivers, canals and lakes, and of the regulations necessary for this purpose. — Monopoly of traction.**

Third Question. — **Equipment of ports of inland navigation, especially the advance made in electric plants.**

Fourth Question. — **Canals which serve both for navigation and for irrigation.**

Fifth Question. — **Protection of low-lying lands against invasion by water.**

B. — COMMUNICATIONS.

First Communication. — **Application of reinforced concrete to hydraulic constructions.**

Second Communication. — **Participation of the Government and the various parties interested in the expenses necessary for the development of inland navigation, including, if required, the power to be given to the Government to acquire a part of the land which would be improved in value along new waterways.**

Third Communication. — **Hydrometric services, prediction of floods and depths of water.**

SECOND SECTION

Ocean Navigation.

A. — QUESTIONS.

First Question. — **Fishery harbours and harbours of refuge for the coasting trade.**

Second Question. — **Inland maritime ports and means of access thereto. Their advantages. Economic and technical study.**

Third Question. — **Construction of ports on sandy shores.**

Fourth Question. — **General conditions for the security of maritime navigation.**

Fifth Question. — **Hydrographic exploration of the sea.**

B. — COMMUNICATIONS.

First Communication. — **Appliances for repairs (dry docks, floating docks, lifting apparatus, etc.).**

Second Communication. — **Best types of sea-going vessels for transporting freight, in their relation to inland navigation ports and waterways.**

Third Communication. — **Application of reinforced concrete to maritime works. Means to insure its preservation.**

Fourth Communication. — **Report on the most recent works carried out in the principal sea-ports.**

XII^th Congress — Philadelphia 1912

FIRST SECTION

Inland Navigation.

A. — QUESTIONS.

First Question. — **Improvement of rivers by regulation and dredging and, if needs be, by reservoirs. Determination of the cases in which it is preferable to resort to such works rather than to canalization or the construction of a lateral canal.**

Second Question. — **Dimensions to be assigned, in any given country to canals for heavy traffic. Principles of operating. Dimensions and equipment of the locks.**

Third Question. — **Intermediate and terminal ports. Best methods for combining, facilitating and harmonizing the transfer of freight between waterways and railways.**

B. — COMMUNICATIONS.

First Communication. — **Application of reinforced concrete to hydraulic works.**

Second Communication. — **Report on the works undertaken and the measures adopted or proposed for the improvement and development of lines of inland navigation, as well as for the protection of the banks of navigable highways.**

Third Communication. — **Utilization of the navigation of large but shallow rivers. Vessels and motors.**

SECOND SECTION

Ocean Navigation.

A. — QUESTIONS.

First Question. — **Means for docking and repairing vessels.**

Second Question. — **Dimensions to be given to maritime canals. (Technical point of view. Probable dimensions of the sea-going vessels of the future.)**

Third Question. — **Mechanical equipment of ports.**

B. — COMMUNICATIONS.

First Communication. — **High powered dredges and means for removing rock under water.**

Second Communication. — **Report on the most recent works constructed at the more important sea ports, especially those relating to breakwaters. Applications of reinforced concrete. Means for insuring its preservation.**

Third Communication. — **Bridges and ferry bridges; tunnels under waterways used for ocean navigation. Economic and technical study.**

Fourth Communication. — **Safety of navigation. Lighted buoys.**

INTERNATIONAL

MARITIME CONGRESS

NAMES OF THE REPORTERS

AND

TITLES OF THE REPORTS

First Congress — Paris 1889

1. **Desprez,** H. — Role and importance of the equipment of ports. (F.)

2. **Widmer.** — Note on the mechanical equipment of the port of Havre. (F.)

3. **Cadart,** G. — Note on the broadside-on slip at Rouen, on the Labat system. (F.)

4. **Alexandre.** — Note on the spread of the swell in the interior of tidal harbours. (F.)

5. **Schmeleff.** — The port of Reval in the gulf of Finland. (F.)

6. **Baron Quinette de Rochemont.** — The port of Havre. (Present state and proposed improvements) (F.)

7. **Potel.** — Note on the construction of the La Pallice dock in the port of La Rochelle. (F.)

N. B. — The letters F and E, in brackets, coming after the title of a report, indicate that the report was published in French (F.) or in English (E.).

8. **Crahay de Franchimont.** — Construction of the 3rd dock of the commercial port of Rochefort. (F.)

9. **Pasqueau.** — The port of Bordeaux and its entrances. (F.)

10. **Hersent.** — Notes on the works carried out at the port of Lisbon. (F.)

11. **Ciaccone.** — Note on the works recently carried out at the port of Genoa. (F.)

12. **Ribière.** — Note on lightships. (F.)

13. **Fleischer.** — On the relation between luminous signals and the fog signals which are associated with them. (F.)

14. **Baron Quinette de Rochemont.** — The new channel of approach to Rotterdam from the sea. (F.)

15. **Eyriaud des Vergnes.** — Note on the installation and maintenance of ports on sandy foreshores. (F.)

16. **Stoecklin.** — Notes on the openwork piers at the mouth of the Adour. (F.)

17. **Garcia Arenal.** — Note on the quick setting natural cement of Zumaya. (Spain) (F.)

18. **Crahay de Franchimont.** — The improvement of the maritime portion of the Garonne and the upper Gironde. (F.)

19. **Vétillart.** — Foundations in sandy soil of the wharves and locks of the port of Calais. (F.)

20. **Guérard.** — Note on the construction of piers in the sea. (F.)

21. **Mengin.** — Memorandum on the hydraulic power developed by tidal rivers. (F.)

22. **Belleville.** — Monograph on the hydraulic conditions of flow of the tidal portion of the Seine. (F.)

PUBLICATION.

23. *Report of the proceedings of the Congress.* Paris, published by Lahure. 1889. (F.)

Extract from a note by Baron Quinette de Rochemont with regard to the 1st International Maritime Congress.

A certain number of the reports submitted to the 1st Congress gave rise to interesting discussions, which, amongst other things, bore on the establishment and maintenance of harbours on sandy shores; on the spread of the swell of the sea into tidal harbours and the influence of openwork piers in the attainment of clear channels; on the construction of sea dykes; on works for the improvement of tidal rivers, with special reference to those of the rivers Seine and Garonne; on the use in the sea of different kinds of lime, and of quickly setting cements, etc.

In conformity, however, with the decision come to at the first meeting, no vote was taken and no resolution passed. The Congress confined itself to the technical discussion of the questions.

It was finally decided to make the International Maritime Congress a permanent institution, and the Executive Committee was commissioned to make arrangements for another gathering, and to avail itself of the assistance of an International Organizing Commission having its seat in Paris.

IInd International Maritime Congress
London 1893

NAMES OF THE REPORTERS

AND

TITLES OF THE REPORTS

First Section — Harbours and breakwaters

1. **Baron Quinette de Rochemont.** — Construction of breakwaters. (E.)

2. **Luiggi,** L. — Recent breakwaters and sea defences in Italy. (E.)

3. **Hansen,** P. — The breakwater and port of Middelgrunden, in the Sound. (E.)

4. **Möller,** H. C. V. — The construction of a breakwater at the Free Port of Copenhagen. (E.)

5. **Lyster,** A. G. — Dredging operations on the Mersey bar. (E.)

6. **Kinipple,** W. R. — Monolithic construction of sea-works under water by cement grouting. (E.)

7. **Feret,** R. — Choice of sand and proportions of cement for mortars in sea-works. (E.)

8. **de Timonoff,** V. E. — The formation of ports on a sandy coast in a tideless sea. (E.)

9. **de Mey,** P. — On the mode of establishment and maintenance of ports on sandy coasts liable to deposits of silt. (E.)

10. **Spadon,** C. — The improvement of the Lido entrance to the Port of Venice. (E.)

11. **Carey,** A. E. — The harbours and ferry system of Denmark. (E.)

12. **Carey,** A. E. — The La Guaira Harbour works, Venezuela. (E.)

13. **Cimino** and **Verdinois.** — Rock-dredging works in some Italian harbours (Leghorn, Genoa, Palermo). (E.)

Second Section — Docks

14. **Crahay de Franchimont,** N. — Construction and working of the dock of the Port of Bordeaux. (E.)

15. **Cuérard,** A. — On the management of commercial ports and their equipment, with especial reference to the Port of Marseilles. (E.)

16. **Vétillart,** H. — The Port of Havre. (E.)

17. **Charguéraud,** A. — The Port of Calais and its appliances. (E.)

18. **Joly,** P. — The extension of the Port of Dunkirk. (E.)

19. **Royers,** G. A. — Antwerp Docks. (E.)

20. **Inglese,** I. — The extension of a graving dock at Leghorn. (E.)

21. **Carr,** R., and **Duckham,** F. E. — The Docks of London on the north side of the Thames and their appliances. (E.)

22. **McConnochie,** J. A. — The Surrey Commercial Docks. (E.)

23. **Stopford Smyth,** W. — Newport Harbour and Docks. (E.)

24. **Luiggi,** L., and **Borgatti,** E. — Hydraulic installations at the Port of Genoa. (E.)

Third Section
Shipbuilding and marine engineering

25. **Seaton**, A. E. — Steam communication with the Continent, Past and Present. (E.)

26. **Biles,** J. H. — Ocean passenger steamships. (E.)

27. **Blechynden,** A. — A description of the new sand-pump dredger « Brancker » for the Mersey Docks and Harbour Board. (E.)

28. **Fortescue Flannery,** J. — The transport of petroleum in bulk. (E.)

29. **Stromeyer,** C. E. — Marine-boiler construction. (E.)

30. **Denny,** A. — On Shipowners and Shipbuilders in their technical relationships, and some points of interest for their mutual consideration. (E.)

Fourth Section — Lighthouses, Buoys, Fog-signals

31. **Ribière,** C. — Investigations and experiments on compressed air sound signals. (E.)

32. **Kenward**, J. — Ships' lights and collisions. (E.)

33. **Blondel,** A. — On Flash-lights and the physiological perception of instantaneous flashes. (E.)

34. **Bourdelles,** O. — The luminous power of lighthouse apparatus. (E.)

35. **Douglass,** W. T. — On the more efficient illumination of estuaries and rivers. (E.)

36. **Lo Catto,** D. — Harbour lights, buoys, and beacons in Italy. (E.)

37. **Blondel,** A. — On the electric machinery and arc lights of lighthouses. (E.)

38. **Stevenson**, D. A. — Notes of the progress of lighthouses. (E.)

39. **Lo Catto,** D. — Comparison of Gas and Electric light in lighthouses with optical apparatus of large dimensions. (E.)

40. **Hodgkinson,** G. R. N. — The Turkish and Egyptian lighting and light dues in the Red Sea. (E.)

PUBLICATION.

41. International Maritime Congress. Minutes of Proceedings, London: printed and sold by Union Brothers, 27, Pelgrim street. E. C. (E.)

Extract from a note by Mr. Vernon Harcourt on the IInd Maritime Congress.

The work of the Congress was divided amongst four Sections, namely "Section I. Harbours and Breakwaters"; Section II, Docks"; "Section III, Shipbuilding and Marine Engineering"; and "Section IV, Lighthouses, Buoys, Fog-Signals, etc.".

This second meeting of the Maritime Congress proved to be the last meeting of this Congress in an independent form; for at the meeting of the Congress of Inland Navigation at the Hague in 1894, it was decided that the Congress should be united under the more comprehensive title of "Navigation Congresses". In speaking at the concluding general meeting of the Hague Congress, when the fusion of the two congresses was determined upon, Mr. Vernon-Harcourt pointed out the superior organization of the Maritime Congresses, which had rendered such great service in the preparations for the London Maritime Congress of 1893, and he urged the establishment of a similar organization for the Navigation Congresses, which was only finally effected six years later at the Paris Navigation Congress of 1900, on very similar lines to that inaugurated by the first Maritime Congress held in Paris in 1889.

INTERNATIONAL CONGRESS

FOR THE

UTILIZATION OF RIVERS

First Congress — Paris 1889

NAMES OF THE REPORTERS

AND

TITLES OF THE REPORTS

1. **de Llaurado.** — The future of irrigation canals. (F.)
2. **Cotard.** — The future of irrigation canals. (F.)
3. **Lindley,** W. H. — On the use of streams in water distribution. (F.)
4. **Musquetier,** J. A. E. — On the use of water filtered by means of sandhills, heather and sandy soils, for the water supply of towns in Holland. (F.)
5. **Bechmann.** — On the best means of delivering water at private residences. (F.)
6. **Rolland,** G. — On the utilization of artesian water-supplies in the Algerian Lower-Sahara. (F.)
7. **Fournie.** — On the management of watercourses from an agricultural and commercial point of view. (F.)
8. **Barois.** — On the management of watercourses from an agricultural and commercial point of view. (F.)

9. **Jacquet.** — On the improvement of navigable rivers with shifting beds. (F.)

10. **Vernon-Harcourt**, L. F. — On the canalization of rivers, and various systems of moveable weirs. (F.)

11. **Pavie.** — On the canalization of rivers, and various systems of moveable weirs. (F.)

12. **Derôme.** — On the best means of locomotion for vessels on canals and canalized rivers similar to canals. (F.)

13. **Dufourny,** A. — Some data and practical results regarding the Belgian lifts. (F.)

14. **Cadart**, G. — On lifts and inclined planes for vessels. (F.)

PUBLICATION.

15. *Report of the proceedings of the Congress.* Paris, 1889 (F.)
(Article 12 of the Regulations of the Congress laid down that "no resolution was to be drawn up by the Congress".)

---

1. NAMES OF THE AUTHORS

IN

ALPHABETICAL ORDER

A

Abramoff, XI, 84.
Abshoff, IX, 30.
Alexandre, I, M, 4.
Ancona, X, 87.
Anderson, X, 75.
Anfimoff, XI, 68.
Antwerp (Professional league of watermen), VII, 90.
Arenal, XI, 91.
Ashley, X, 90.
Asmussen, XI, 77.

B

Babin, XII, 106.
Bailey, IV, 12, 25; VII, 86.
Barbé, VIII, 34; XI, 78.
Barbet, VII, 21, 29; IX, 7.
Barcelloni, X, 56.
Barling, XII, 74.
Barois, V, 8; R, 8.
Barrillon, XII, 73.
Bartholomew, IV, 2.
Bastiani, X, 81.

Note on the use of the alphabetical tables. — The names of the authors are followed by various figures. The Roman figures I to XII refer to one or other of the twelve Navigation Congresses. The two Maritime Congresses are referred to as I, M, or II, M, while the Congress on the utilisation of Rivers is denoted by the letter R. The ordinary figures following one or other of these abreviations indicate the number under which the report appears in the given Congress.

For instance, take the name of Mr. Bogart, we find against his name the following information : V, 22; IX, 80. The Roman figures V and IX refer to the Vth and IXth Congresses. The figures 22 and 80 are the numbers in the classified list of reports under which come the reports submitted by Mr. Bogart to the Vth and IXth Congresses respectively. Reference to these latter will give the full titles of the reports appearing under the classification numbers 22 and 80.

Batard-Razelière, IX, 88.
Bates, VII, 48; VIII, 48; X, 116.
Baucke, XII, 10.
Bay, VII, 88.
Beach, XII, 46.
Beaurin-Cressier, V, 28.
Bech, X, 78; XII, 93.
Bechman, R, 5.
Behrend, IX, 18.
Bekaar, VI, 10.
Beliawin, XI, 80.
Belleville, I, M, 22.
Bellingrath, V, 19.
Benduhn, X, 69.
Bensel, XII, 70.
Beretta, XII, 42.
Bergius, XII, 37.
Berlingieri, X, 40, 106.
Bernardi, X, 118.
Bernardini, X, 82, 100, 126.
Berni, X, 132.
Bertrand, IX, 16.
Bifulco, XI, 23.
Biles, II, M, 26.
Bindemann, VIII, 1; XI, 42.
Blechynden, II, M, 27.
Blondel, II, M, 33, 37.
Blümcke, X, 28; XII, 47, 80.
Boet, X, 140.
Bogart, V, 22; IX, 80.
Boklevsky, XI, 83.
Bompiani, IV, 33, 34; V, 7.
Bonaeira, X, 146.
Borgatti, II, M, 24.
Bormann, X, 121.
Bottemanne, XI, 49.
Bourdelles, II, M, 34.
Bourgougnon, XII, 16.
Bourguin, VII, 17; VIII, 17.
Bouvier, V, 10.
Box, XII, 57.
Brandt, IX, 56; XI, 60.
Braun, XII, 111.
Bredow, XI, 9.
Brown, XI, 20.
Bubendey, VII, 33; IX, 1; X, 93; XII, 71.
Buchheister, VII, 33, 59.
Buckley, XI, 20.
Burgdorffer, VI, 11.
Burr, E., XII, 89.
Burr, W., XII, 102.
Büsser, IX, 30.

C

Cadart, I, 4; V, 11; I, M, 3; R, 14.
Caizzi, X, 104.
Caméré, V, 23; VI, 8.
Captier, V, 16, 57; VIII, 24; X, 3.
Carr, II, M, 21.
Carey, XI, 48; XII, 96.
Carissimo, X, 5.
Carling, XI, 36.
Carstanjen, IX, 47; XI, 2.
Castendyk, VI, 22, 32.
Castiglioni, XII, 42.
Cattolica, X, 113.

Cay, VIII, 47; X, 77.
Centralverein für Hebung der deutschen Fluss- und Kanalschiffahrt, VII, 95.
Chargéraud, VII, 63, 69; IX, 21; X, 107; II, M, 17.
Chamber of Commerce of Dunkirk, VIII, 53.
Chamber of Commerce of Namur, VIII, 44.
Chenu, VII, 15.
Cipoletti, X, 7, 133; XI, 5.
Clarke, X, 37.
Clements, IV, 36; V, 30.
Coblentz, XII, 106.
Coen Cagli, X, 80, 126; XI, 94.
Colson, X, 117.
Committee of study for the elaboration of a sheme for the permanent organisation of International Navigation Congresses, VIII, 42.
Comstock, V, 59.
Connochie, II, M, 22.
Connor, XII, 39.
Contag, X, 123, 124.
Cool (Wouter), X, 26; XI, 34, 88; XII, 76.
Corthell, V, 48; VIII, 39; X, 84; XII, 65.
Cotard, R, 2.
Couvreur, V, 29.
Cozza, X, 127.
Crahay de Franchimont, VII, 35, 40; I, M, 8; II, M, 14.
Cramer, VI, 12.
Crawford, IV, 23.
Crotti, X, 5.
Crugnola, X, 15.
Cucchini, X, 91, 101, 102; XI, 23.
Czarnomski, II, 8; X, 141.

D

da Costa Couto, VII, 84.
da Costa, IX, 87.
Dardenne, VI, 4.
de Blocq van Kuffeler, XII, 98.
de Bovet, V, 26; VI, 14; VII, 18; X, 24.
de Conda (Bela), V, 53; VIII, 57; XI, 17, 93.
de Hoerschelmann, IV, 7; V, 4, 13; VI, 35; VII, 24; VIII, 45; XII, 44bis.
Deinlein, XI, 3.
de Joly, IX, 76; X, 79; XII, 113.
de Jongh, VI, 5; VII, 57, 62.
de Kanter, XII, 76, 86.
Deking Dura, V, 31; VI, 19; VII, 23; IX, 23.
de Kvassay, VIII, 6; XI, 28; XII, 8.
Delachanal, VIII, 41.
Delaunay-Belleville, V, 35.
de Lelavski, VI, 28; X, 52.
de Llaurado, IV, 31; V, 9; R, 1.
de Mas, I, 1; III, 11; VI, 13; VII, 13.
De Mey, V, 58; II, M, 9.

Denèfle et Cie, VII, 79.
Denil, IX, 2; X, 45.
Denny, II, M, 30.
Denys, V, 6.
de Préaudeau, XI, 33.
Derôme, V, 17, 24; VI, 2; VII, 71; R, 12.
de Sanctis, X, 42, 44.
Descans, J., XII, 38.
Descans, L., XII, 54, 104.
de Schokalsky, XI, 66, 69; XII, 117.
De Schryver, VII, 16; IX, 17.
de Smet de Nayer, XI, 54.
Desprez, VII, 49; IX, 71; I, M, 1.
de Sytenko, III, 2; IV, 6; V, 32.
de Thierry, IX, 64; XII, 63.
de Timonoff, V.-E., IV, 8; V, 54; VI, 33; VII, 54; VIII, 13; IX, 85; X, 60; XI, 6, 57, 70, 81; XII, 11; II, M, 8.
de Vito, X, 89.
d'Hénouville, XI, 39.
Dibos, VI, 9.
Dieckhoff, V, 19.
Dill, III, 5.
Dmitrieff, XI, 95.
Donald, XII, 55.
Doneaud, X, 144.
Doniol, VIII, 51.
Douglass, X, 111; II, M, 35.
Doyer, VI, 23.
Dratch, XI, 95.
Drouginine, XI, 30.
Duckham, II, M, 21.
Ducrocq, VII, 56.
Dufourny, IV, 28; VI, 17; R, 13.
Dupuy de Lome, I, 7.
D'Urso, X, 81.
Dusuzeau, XII, 40.

E

Egan, VIII, 19; XII, 58.
Eich, VII, 43.
Eisenlohr, XII, 22.
Ekerlé, XI, 65.
Ely, V, 41.
Endicott, XII, 52.
Engels, VIII, 14; IX, 39.
Ermerins, VI, 24.
Eyriaud des Vergnes, I, M, 15.

F

Fargue, V, 50.
Fellenius, XII, 100.
Fendius, VII, 2, 6.
Feret, II, M, 7.
Flamant, IV, 11; VII, 68.
Flamm, VII, 11; IX, 82.
Fleischer, I, M, 13.
Fleming, IV, 5.
Fleury, V, 44.
Fontaine, IV, 10; V, 12.
Fortescue Flannery, II, M. 28.
Forti, XII, 107.

Fossataro, XII, 85.
Fournié, R, 7.
Franzius, III, 13; V, 46; VII, 32; VIII, 38; IX, 67.
Frola, X, 43.
Fülscher, VII, 41; IX, 54.
Fumanti, X, 27.

G

Galliot, V, 56; VII, 31; VIII, 9.
Garcia Arenal, I, M, 17.
Garcia-Faria, VIII, 33.
Geck, IX, 63.
Genard, VII, 26; IX, 2; X, 21.
General Government of Algeria, XII, 90.
Gérard, VIII, 49; IX, 29; X, 37
Gerdau, IX, 4; X, 16.
Gerhardt, VII, 42.
Germelmann, V, 14; VII, 46; X, 54; XII, 13.
Gervais, XI, 18.
Gherassimoff, VII, 78; IX, 12.
Giaccone, VIII, 36; I, M, 11
Girardon, VI, 31.
Girola, X, 25.
Giroukhine, XI, 59.
Glaudot, XII, 14.
Gobert, II, 7; III, 7.
Gockinga, XII, 10.
Golovnine, XI, 25.
Graftio, IX, 38.
Grenier, VII, 44; VIII, 2; X, 96; XI, 54.
Greve, IX, 52.
Grillo della Berta, X, 127.
Gritton, VII, 93.
Gröhe, VI, 1; VII, 14.
Grönwall, XII, 118.
Gruner, IX, 27.
Grunsky, XII, 62.
Guérard, V ,49; VII, 61; IX, 65; X, 55; I,M, 20; II, M, 15.
Guersevanoff, XI, 95.
Guiard, VI, 21.
Guiffart, XII, 56.
Gullini, X, 73.

H

Haack, IX, 39.
Hage, IX, 62.
Hagen, III, 9.
Halatz, V, 45.
Hansen, F., XI, 7; XII, 20.
Hanssen, VII, 92.
Harts, XII, 4.
Harttung, V, 37.
Hasskarl, XII, 94.
Hatschek, VI, 16.
Haupt, IX, 89.
Havestadt, X, 123, 124; XI, 10.
Hedde, XII, 53.
Heller, VII, 94.
Hensel, XI, 42.
Henfrich, IX, 44.
Herrmann, IX, 61; X, 17; XII, 78, 101.
Hernandez, XII, 81.

Hersent et fils, VII, 74; I, M, 10.
Hertogs, VII, 67.
Heubach, IX, 19.
Hillinger, IX, 48.
Hirsch, VI, 13; VII, 9.
Hodgdon, X, 97; XII, 72.
Hodges, XII, 15.
Hodgkinson, II, M, 40.
Holtz, II, 4; IV, 32.
Hoszpotzky, VIII, 20.
Hotopp, IX, 56.
Howaldt, IX, 68.
Huebner, XII, 23bis.
Huet, I, 5, 10.
Humphrey, XII, 30.
Hungarian State water survey Department, V, 22; XII, 33.
Hunter, VII, 45; IX, 22, 58; XI, 53.
Hurtzig, IV, 25.
Hutton, VIII, 8.

I

Iankowsky, XI, 90.
Imroth, V, 34.
Inglese, X, 143; XII, 97; II, M, 20.
International school of lightmen of Antwerp, VII, 89.
Iskolski, IX, 33.
Iszkowski, VII, 77.
Ivanina, XI, 65.
Ivanovsky, XI, 40.

J

Jaba, XI, 58.
Jacquemin, VIII, 3.
Jacquet, R, 9.
Jacquier, I, 13.
Jacquinot, XII, 31.
Jahnel, IX, 34.
Jasmund, VI, 20.
Jeans, J. **Stephen,** IV, 37.
Jitkoff, VIII, 45.
Johnson, XII, 21.
Joly, IX, 57; X, 71; II, M, 18.
Jorini, X, 83.
Just, VII, 22; IX, 75.

K

Kanalverein für Niedersachsen, VII, 81.
Karaulow, IX, 38.
Kauffmann, XII, 6.
Keller, IX, 45; X, 8.
Kenward, II, M, 32.
Kinipple, II, M, 6.
King, XII, 67.
Kisker, X, 41; XI, 38.
Kleiber, X, 51; XI, 41; XII, 11.

Koch, XII, 84.
Körte, VIII, 25; IX, 81; X, 110.
Köttgen, VIII, 15; IX, 31; X, 33.
Kounitzky, XI, 37.
Kretz, X, 48.
Kuhn, IX, 10.
Kwitzinsky, IV, 9.

L

Lafosse, X, 12.
Lambrechtsen van Ritthem, VII, 58.
Lampugnani, X, 72.
Landgraf, V, 37.
Landreth, XII, 5.
La Rivière, VII, 17 ,21; X, 38.
Lasmolles, V, 25.
Lauda, X, 9; XII, 3.
Laurell, IX, 13.
Leader-Williams, III, 8.
Leboucq, V, 5.
Le Brun, VII, 83.
Leemans, XII, 68.
Lefebvre, VII, 27; IX, 3; X, 22.
Lelong, X, 65.
Lentz, IX, 74.
Lévy, IV, 13, 14.
Lévy-Salvator, XI, 22.
Lewandowski, XI, 45.
Liebrechts, IX, 53.
Lindenthal, XII, 105.
Lindley, R, 3.
Lindgren, IV, 34.
Loewe, IX, 86.
Loewer, IX, 77.
Lo Catto, X, 74; XI, 63; II, M 36, 39.
Lokhtine, X, 14.
Lombard-Gérin, VIII, 18.
Luiggi, IV, 33; V, 7; IX, 70; XII, 59, 97; II, M, 2, 24.
Lundberg, XI, 36; XII, 100.
Lyster, VIII, 29; II, M, 5.

M

Mager, VII, 94.
Mailliet, V, 15; XI, 43.
Maksimovicsz, VI, 29.
Mallet, XII, 24.
Malm, XI, 7; XII, 45.
Marchetti, II, 6.
Maritime Installations of Belgium, VIII, 54 .
Marlio, XI, 12.
Marote, VIII, 3; XII, 88.
Marten, IV, 3; VII, 4, 10.
Marzolo, XI ,73.
Massalski, VII, 51.
Mathies, VII, 25.
Maximoff, X, 6; XI, 1, 74.
Mazoyer, V, 18.
Mazza, X, 68.
Melchers, III, 6.
Mélotte, VII, 28; IX, 55.
Melville, X, 88.

Mendes Guerreiro, V, 61; VI, 34; VIII, 37.
Mengin-Lecreulx, V, 50; VI, 21; I, M, 21.
Menocal, IV, 21.
Merczyng, IX, 36, 50; X, 39; XI, 8; XII, 51.
Merkens, V, 37.
Meyer, A. F., VII, 55.
Meyer, E. G., XII ,71.
Migliardi, X, 145.
Millis, VIII, 26; XII, 112.
Moeller, XI, 85.
Molini, XI, 91.
Molinos, V, 26.
Mollard, IX, 32.
Möller, XII, 93; II, M, 4.
Mönberg, XII, 93.
Mönch, XII, 53, 91.
Monet, V, 36; VI, 4.
Mordovine, XI, 72, 75.
Moschini, X, 1.
Müller, B., XII, 3bis.
Müller, S., XI, 31.
Musquetier, R, 4.
Mütze, V, 20.

N

Narten, VI, 7; VII, 38; X, 62.
Nelemans, VI, 10; IX, 60.
Newcomer, XII, 1, 36.
Newell, XI, 21.
Nikolsky, XI, 89; XII, 35.
Nilsson, XII, 109.
Nobel, IX, 72; XI, 79; XII, 60.
Noble, XII, 12.
Noble Twelvetrees, XI, 32, 86.
Nolthenius (Tutein), VI, 25; VII, 66; VIII, 5.
North, V, 42.
Nyssens-Hart, VII, 60; VIII, 31; X, 95.

O

Ockerson, VIII, 46; X, 49; XI, 26.
Offermann, IX, 5; X, 138.
Orlando, X, 58, 130, 131; XI, 56.
Ottmann, XI, 15.

P

Paladini, X, 30, 32.
Parsons, X, 63.
Pasqueau, V, 60; I, M, 9.
Pavie, VII, 3, 7; R, 11.
Pecoraro, X, 67.
Peez, II, 2.
Pelletreau, V, 55.
Perilli, X, 103; XII, 34.
Pescheck, V, 38.
Peslin, V, 2.
Peters, IX, 20.
Philippe, III, 12.

Philippeo, IX, 66.
Piens, VII ,65; VIII, 31; X, 95.
Pierrot, IX, 55.
Pirot, VII, 20.
Pokorny, X, 128.
Polissadoff, XI, 82.
Polkowski, VII, 80.
Pollack, V, 39.
Ponti, IX, 37.
Potel, I, M, 7.
Pouzirevsky, XII, 19.
Prüsmann, IX, 37; X, 17, 135.
Pullino, X, 109.
Putnam, XII, 110.

Q

Quinette de Rochemont (Baron), VIII, 35; X, 99; XI, 92; I, M, 6, 14; II, M, 1.

R

Ragoczy, XI, 38.
Ramaer, VII, 37.
Raymond, IX, 14.
Rayner, XII, 49.
Renaud, VI, 18.
Reynolds, III, 14; IV, 17.
Rhodes, IV, 4.
Ribière, VIII, 27; X, 112; I, M, 12; II ,M, 31.
Riedel, IX, 49; X, 10, 31.
Rigaux, VI, 8.
Rigoni, I, 3.
Rischowski, IX, 25.
Robert, VIII, 4.
Roberts, V, 43.
Roeder, VII, 8.
Roessler, V, 34.
Rojdestvensky, X, 105; XII, 108.
Rolland, R, 6.
Roloff, VII, 1, 5; X, 47.
Romanoff, XI, 14.
Rosing, X, 115; XI, 52.
Rosshirt, IX, 43.
Rota, VIII, 21; IX, 41; X, 66, 92; XI, 67.
Roummel XI, 46.
Roundo, XI, 13.
Royers, II, M, 19.
Rubin, VIII, 56.
Rudloff, IX, 69.
Rudolph, VII, 30; VIII, 50.
Ruprecht, IX, 28.
Rytel, XI, 19, 29.

S

Saint-Yves, IV, 22.
Salvagne, VII, 73.
Saner, IV, 1; IX, 8; XI, 11; XII, 41.
Sanford, XI, 62.
Sanjust di Teulada, XI, 23; XII, 18.
Sassi, X, 50, 122.
Saunders, XII, 79.
Schiruchin, IX, 84.

Schlichting, II, 3; III, 4; IV, 26; V, 1.
Schmeleff, I, M, 5.
Schnapp, VII, 19; IX, 6; XI, 2; XII, 29.
Scholer, IX, 78.
Schönbach, IX, 11.
Schonberg, IV, 19.
Schrom, II, 5; V, 40; VII, 70; VIII, 23; IX, 42; X, 19.
Schulte, VIII, 7.
Schultz, VI, 36, 37; VII, 64; VIII, 28; X, 136.
Schultze, X, 93.
Schütte, IX, 83.
Schurman, J. A., VI, 6.
Schuurman, C. B., VI, 11, 26.
Scotti, X, 134.
Seaton, II, M, 25.
See, X, 64.
Seibt, VII, 82.
Seidel, VI, 30.
Seifert, X, 142.
Sewell, XII, 28.
Sheridan, XI, 16.
Sibert, XI, 4.
Silitsch, XI, 50.
Simoncini, X, 81.
Smrcek, X, 20.
Smulders, VII, 53.
Snyers, X, 36.
Society of marine installations of Bruges, VII, 75.
Soliani, X, 61, 114.
Somzée, VII, 91.
Spadon, II, M, 10.
Spalving, XII, 77.
Spitzin, XI, 71.
Squire, IX, 59.
Staniford, XII, 23.
Stelkens, IX, 26.
Stevenson, IV, 24; XII, 114; II, M. 38.
Steyn Parvé, VI, 27.
Stieltjes, VI, 15.
Stoecklin, I, M, 16.
Stopford Smyth, II, M, 23.
Ströhler, IV, 29.
Stromeyer, II, M, 29.
Suadicani, IX, 75.
Suling, XI, 52.
Sullivan, X, 98.
Sundblad, XII, 88.
Suppan, VII, 12; VIII, 10.
Symons, X, 23.
Sympher, II, 1; IV, 27; V, 27; X, 137; XI, 51; XII, 2.
Szystovski, XI, 51.

T

Tartrat, XII, 106.
Tavernier, X, 4.
Tchekhovitch, X, 59.
Techel, X, 62.
Tenge, IX, 51.
Teubert, XI, 9.
Teugels op de Beeck, I, 9.
Thiel, III, 10.
Thiele, VIII, 16; IX, 28, 40; X, 34.
Thiem, V, 21.
Thomas, IX, 9.

Thwaite, X, 35.
Tomkins, XII, 23.
Tornani, X, 46.
Toukholka, XI, 24.
Townsend, XII, 48.
Treniukhinn, XI, 76; XII, 61.
Triest, VI, 38.
Troost, V, 47.
Troté, XI, 27.
Truhlsen, VIII, 25; IX, 79.
Tsimbalenko, XI, 18.
Tsionglinski, XI, 6, 13; XII, 27.
Turazza, X, 53.

U

Umlauf, X, 138, 139.
Uttini, VII, 85.

V

Valentini, XI, 44; XII, 9.
Van Bosse, VIII, 12.
van Braam van Vloten, XII, 116.
Van der Borght, V, 37.
Van der Schueren, VIII, 32; IX, 73; X, 94.
van der Sleyden, IV, 35; V, 3; VI, 32.
Vander Vin, V, 47; VII, 34, 39; XII, 64.
Van Drunen, I, 11, 12.
Van Gansberghe, VII, 47.
Van Haute, X, 96.
Van Hoof, VI, 26.
van Konynenburg, XII, 10.
van Loon, XII, 43.
van Oordt, XI, 49.
van Panhuys, X, 26; XII, 10.
Vauthier, VIII, 43.
Vawdrey, XII, 32.
Verdinois, X, 86.
Verneaux, X, 108.
Vernon-Harcourt, IV, 16; V, 51; VII, 36; VIII, 30; X, 18, 76; XI, 61; R, 10.
Vétillart, VII, 56; VIII, 40; X, 85; I, M, 19; II, M, 16.
Viansson, I, 8.
Vidal, XI, 55; XII, 83.
Voisin, VII, 50; XI, 87; XII, 95.
Volkmann, IX, 31.
von Biegeleben, IX, 15.
von Doemming, V, 33.
von Klitzing, XII, 53.
von Schrötter, VII, 94.
von Stockert, X, 138, 139.
von Studnitz, III, 1.
von Sytenko, III, 2; IV, 6; V, 32.
Vosnessensky, VIII, 55; XI, 35.

W

Wahl, VIII, 11; X, 29.
Wallandt, III, 3.
Weiss, IX, 35.
Welcker, V, 52; VI, 61.
Wells, IV, 15.
Wendemuth, XII, 103.
Wesseling, XII, 86.
Wheeler, IV, 18; VII, 52.
Whinery, X, 2.
Widmer, I, M, 2.
Wilhelm, X, 129.
Wilhelms, XI, 47.
Williams, IV, 20.
Williamson, XII, 82.
Winter, X, 70.
Wittenberg, IX, 46.
Wodarski, XII, 44.
Wolfschütz, X, 11.
Wortman, VI, 3; XI, 64.
Wulle, X, 136.

Z

Zamjatin, XII, 69.
Zanen, XII, 104.
Zdenko, X, 147.
Zédé, I, 6.
Zone, VII, 16; IX, 17.
Zörner, IX, 24.

2. ALPHABETICAL TABLE

OF THE

WATERWAYS AND PORTS

mentioned in this work, by name or by country

1° INLAND NAVIGATION

a) Rivers with free-running current.

Aire, IV. 2.
Calder, IV. 2.
Danube, II. 9.
Dnieper (rapids), VI. 33. — XI. 141. — XII. 44 (a)
Elbe, II. 9. — V. 19, 33, 38, 39. — VIII. 56. — IX. 145. — XII. 3, 3a.
Hudson, XII. 157.
(The) Hunte, IX. 51.
La Plata, IX. 144.
Lek, VI. 24.
Meuse, VI. 25. — VIII. 3.
Mississipi, V. 29. — VIII. 46. — X. 49. — XI. 26.
Moldau, VIII. 56. — IX. 145.
Oder, IV. 29. — V. 19, 33, 38.
Ourthe, VIII. 3.
Parana, IX. 144.
Rhine, V. 20, 34. — VI. 24.— IX. 94, 99.
Rhone, I. 10. — VIII. 18.
St. Lawrence, XII. 168.
Volga, IV. 8. — X. 51.
Weaver, IV. 1.
Weser, IX. 134.

b) Inland Canals.

Aire and Calder (canal) IV.2.
Burgundy canal, V. 56.
Central canal (Germany), VII. 81.
Central canal (Belgium), VII. 26. — IX. 2.
Charleroi to Brussels canal, VII. 15, 27. — VIII. 3.
Coast canal, IX. 118.
Danube to the Moldau (canal), IX. 147.
Danube and Oder canal, X. 20.
Dortmund-Ems canal, VIII. 16. — IX. 63, 95, 97.
Eastern canal (France), I. 9.

Erie canal, V. 22. — XII. 165.
Hohensaaten-Spandau canal, V. 21.
Iron gates, V. 53.— VIII. 19.20.
Ladoga canal, XI. 102.
Lek canal, VI. 24.
Lower Rhine canal VI. 24.
Maestricht - Bois-le-Duc, VI. 28
Marie canal (Russia), II. 8. — IV. 7. — XI. 101.
Mittellandkanal, IX. 107,114, 130, 133.
New York State barge canal, XII. 130.
Oder-Spree canal, VI. 36.
Pannerden canal, VI. 24.
Rhine and Elbe canal, IX. 111, 115, 116, 119, 125, 128
Rhine-Weser-Elbe canal, VII, 81, IX. 109, 110, 124, 131.
St. Mary's Falls canal, XII. 158.
Tetlow canal, X. 123, 124.
Volga-Neva canal, IV. 7.

c) Waterway system of various countries.

Argentina, IX. 144.
Austria, V. 40. — IX. 48, 49, 145, 147.
Belgium, IV. 28. — V. 5, 15. — VI. 17. — XII. 14, 38
Canada, I. 4. — IV. 5. — XII. 132.
France, IV. 32. — V. 2, 6, 16, 18, 23 to 25, 35. — VI. 18. — IX. 32. — X. 4. — XII. 16.
Germany, IV. 27. — V. 19, 20, 21, 27. — IX. 20, 93 to 143. — XI. 13.
Great Britain, IV. 3, 30. — V. 30.
Hungary, V. 45. — VII. 22. — VIII. 6, 57.
Italy, IV. 33, 34. — V. 7. — X. 127, 131. — XII. 18, 42.
Holland, IV. 35. — V. 3, 31. — VI. 3. — VII. 23. — VIII. 5.
North America, V. 41, 42, 43. — X. 23.
Russia, IV. 6, 7, 8, 9. — V. 4, 32. — VI. 35. — VII. 24. — X. 39. — XI. 101. — XII. 19, 144.
Spain, IV. 31.
Sweden, IV. 36. — XII. 20.
United States, V. 42, 43. — X. 2.
Uruguay, IX. 144.

d) Inland Ports.

Berlin, IX. 136.
Buda-Pesth, XI. 47.
Buffalo, XII. 157.
Cleveland, XII. 148.

Crefeld, IX. 44.
Duluth, XII. 131.
Elbe (ports of the), V. 33.
France (ports of) V. 35. — VI. 4.
Leer, IX. 103.
Magdeburg, IX. 104, 105.
Münster, IX, 106.
North America (ports of) X, 98. — XI. 16.
Oder (ports of the), V. 33.
Rhine (ports of the), V. 34. — IX. 43, 44.
Ruhrort, IX. 101.
Russia (ports of), XI. 18, 50. — XII. 27.
Transsiberian railway (terminus port), XI. 138.
United States (ports of), XII, 23a.

2 OCEAN NAVIGATION

a) Tidal and non-tidal main-streams.

America, V. 48.
Danube, R. V. 53. — VI. 76. — X. 59.
Elbe, R. V. 19. — VII. 33, 38.
Garonne, R. I. M. 18. — V. 60.
Germany, VII. 46.
Gironde, R. I. M. 18. — V. 60.
Hooghly, R. VII. 36.
Mersey, R. VII. 36.
Mississipi, R. V. 59. — VIII. 46. — X. 49. — XI. 26.
Neva, R. XI. 102.
Po, R. X. 56, 57.
Rhone, R. V. 49. — X. 55.
Rotterdam to the sea. I. M. 14. — V. 52. — VI. 27, 38. — VII. 37.
Scheldt, R. V. 47, 58. — VII. 47. — VIII. 2.
Seine, R. I. M. 22. — V. 50.
Tagus, R. V. 61.
Volga, R. IV. 8. — V. 54. — X. 51. — XI. 103.
Weser, R. VII. 32.

b) Ship-Canals.

Bruges ship-canal, VII. 65.
Brussels to the Rupel canal, IX. 17.
Canal at the mouths of the Dnieper and Bug rivers, IX. 85.
Corinth canal, IV. 22.
Forth and Clyde canal scheme, IV. 23, 24.
Ghent to Terneuzen canal, X. 96.
Kaiser Wilhelm canal, IX. 86, 138.
Manchester ship-canal, IV. 20.
Nicaragua canal scheme, IV. 21.
Panama canal, XII. 128, 137.
St. Petersburg canal, IX. 84. — X. 105.

c) Sea Ports

Algeria (ports of), VII. 68. — XII. 90.
Amsterdam, VI. 6.
Antwerp, II. M. 19. — VII. 72, 73.
Bahia-Blanca, IX. 70.
Barcelona, VIII. 33.
Belgium, VII. 72, 73, 75. — VIII. 31. — X. 95. — XII. 54.
Bilbao, VIII. 33.
Bizerta, XII. 184.
Boulogne, VII. 50.
Bordeaux, I. M. 9. — II. M. 14. — X. 73.
Boston (U. S. A.), X. 97. — XII. 142 to 145.
Bremen, X. 93.
Bremerhaven, IX. 69, 138. — XII. 53.
Brest, XII. 56.
Bruges, VII. 75.
Calais, I. M. 19. — II. M. 17. — XII. 73.
Canada (ports of), XII. 132.
Cherbourg, XII. 56.
Denmark, XII. 93.
Dunkirk, VIII. 53. — II. M. 18.
Dutch Indies, XII. 60.
Emden, IX. 96. — X. 93.
Emperor Alexander the IIIrd. XI. 80.
Fiume, XI. 93. — XII. 58.
France (ports of), VIII. 34, 35. — IX. 71. — X. 99. — XI. 78, 92. — XII. 56, 73, 95.
Genoa, I. M. 11. — II. M. 24. — X. 72, 100.
Ghent, X. 96. — XII. 54.
Germany (ports of), VIII, 28. — X. 93. — XII. 53, 71, 91.
Great Britain, VIII. 30. — XII. 76, 96.
Great Lakes, X. 98.
Hamburg, VII. 59. — X. 70, 93. — XII. 71.
Harbourg, X. 93, 136.
Havre, I. M. 2, 6. — II. M. 16. — VII. 56. — XII. 56, 75.
Hungary (ports of), XI. 93.
Italy, II. M. 20. — VIII. 36. — X. 81, 126. — XI. 94. — XII. 59.
Kiel, XII. 53.
Leghorn, II. M. 20.
Lisbon, I. M. 10. — VII. 87. — XII. 187.
Liverpool, VIII. 29.
London, II. M. 21.
Lubeck, X. 93.
Marseilles, II. M. 15. — IX. 65. — X. 73. — XII. 56.
Massachusetts, X. 97.
Monaco (port of), IX. 88.
Naples, X. 80, 104. — XII. 97.
Netherlands, XI. 49. — XII. 60, 98.
Newport (U.S.A.), II. M. 23.
Odessa, XII. 77.

Ostend. VIII. 32. — IX. 73. — X. 94.
Palice (La), I. M. 7.
Portugal, VIII. 37. — IX. 87.
Reval, I. M. 5.
Rochefort, I. M. 8.
Rome (sea-port), X. 130, 131.
Rotterdam, VI. 5. — IX. 72. — XI. 79. — XII. 76.
Rouen, X. 73.
Russia (ports of), VIII. 55. — IX. 50. — XI. 50, 57, 58, 65, 95, 126. — XII. 61, 77.
St. Petersburg, XI. 95.
Savona, X. 100.
Soerabaja (Dutch Indies) XII. 60.
Spain, XI. 91.
Stettin, X. 93.
Sweden (ports of), XII. 100.
Surrey, II. M. 22.
Tampico, IX. 150.
Toulon, XII. 56.
Tunisia (ports of), XII. 78, 101.
United States, X. 97, 98. — XI. 62. — XII. 23, 55, 72, 94.
Venice, X. 73, 101, 102.
Vera Cruz, IX. 151.
Wilhelmshaven, XII. 53.
Zeebrugge, VII. 75. — VIII. 31. — X. 95.

3. SUBJECT MATTER INDEX

OF THE

PROCEEDINGS OF THE NAVIGATION CONGRESSES

N. B. — At the end of this index will be found a «GENERAL RESUME» of the proceedings of the Congresses.

1 INLAND NAVIGATION

A) Working and Management.

a) *Rivers with free-running current.*

Improvement in the navigability of rivers, by regulation of the flow, dredging and reservoirs.

III. 2nd Q, 3, 4. — I. M. 18. — R. 9 to 11. — IV. 1st S. 1st Q, 1, 2, 6, 8, 9. — V. 13, 53, 59. — VI. 4th S, 6th and 7th Q, 20 to 33. — VII. 76, 77, 83. — VIII. 1st S, 1st Q, 1 to 6. — VIII. 13, 43, 46. — IX. 15th C, 52. — X. 1st S, 6th C, 46 to 52. — XI. 139. — XII. 1st S, 1st Q, 1 to 11.

Note on the subject-matter index and its use. — The titles are followed by a number of letters and figures. The Roman figures I to XII refer to one or other of the twelve Navigation Congresses. The two Maritime Congresses are denoted by the abreviations I. M. and II. M., that of the Utilisation of Rivers, by the letter R. The letters S, Q and C preceeding the arabic numeral indicate the section (S.), the question (Q.) or the communication (C.) which deals with the matter, and refers also to the resolutions adopted by the Congress. The Arabic numerals which follow one or other of these abreviations indicate the number of the report to the Congress, in which the matter is dealt with. Usually a communication (C.) has not given rise to any suggestions or resolu-

Formulary of information characteristic of a free running river.
VI. 4th S, 6th and 7th Q, 1° p. 84. — XII. 1st S, 1st Q, *c)* p. 252.

Dredging [see 2° *Maritime Navigation.* A) *Dredging* under the letter d)].

Reservoirs [see letter c) «*Reservoir dams*»].

Conditions of flow and discharge of rivers. (Influence on the destruction of forests and the drying-up of marshes).
X. 1st S, 2nd Q, 7 to 14.

Natural waterways of shallow depth.
VIII. 2nd S, 3rd Q, 10 to 12. — IX. 1st S, 3rd C, 33 to 36. IX. 53. — X. 1st S, 4th Q, 27 to 29. — XII. 1st S, 3rd C, 46 to 51.

b) *Canalised rivers.*

Improvement of navigability there of.
II. 2nd Q, 3 and 4. — VIII. 1st S. (Supplementary question.) — IX. 1st S, 14th C, 51. — XII. 1st S, 1st Q, 1 to 11.

---

tions, as it would be contrary to the Regulations of the Association for it to do so.

Let us take as an example, under the title of « *Improvement in the navigability...* », the following abreviation VIII. 1st S, 1st Q, 1 to 6.

— The Roman numeral VIII refers to the VIIIth Congress of Navigation.

— The figures 1st S, 1st Q, indicate : 1stly that the subject was discussed by the 1st Section of the Congress and was the 1st Question for consideration; 2ndly that the suggestions and resolutions adopted by the Congress as regards this question are to be found in the chapter entitled « *Resolutions adopted by the VIIIth Congress* » under the heading of « *First Section, First Question* ».

— The Arabic numerals 1 to 6 are the numbers relating to the reports submitted to the Congress on that question. Reference to these will show, in full, the names of the writers and the titles of the reports.

Moveable weirs and dams.

R. 9 to 11. — IX. 12. — IX. 1st S, 47, 51, 52. — XI. 1st S, 1st Q, 1 to 7. — XII. 1st S, 1st Q, 1 to 11.

Weirs and dams (strengthning of and prevention of leakage of their sills).

VII. 1st S, 2nd Q, 5 to 7.

Weirs and dams (raising of the water-level).

VII. 1st S, 1st Q, 1 to 4.

Weirs and dams (utilisation of the fall of water).

VII. 1st S, 3rd Q, 8 to 10. — IX. 1st S, 1st C, 37, 38. — XI. 1st S, 1st Q, 1 to 7.

Defence of banks [see c) *Canals:* Defence of banks of waterways].

Locks [see c) *Canals:* Locks].

Management [see d) "*Ports*" and e) "*Traction and propulsion*"]

c) *Canals.*

Construction and improvement of canals.

I. 4th Q. — II. 2nd S, 2nd Q, 3, 4. — R. 7, 8. — VI. 1st S, 1st Q, 1 to 3. — VI. 37. — VIII. 1st S. (Suppl. question.) — IX. 122. — X. 127. — XI. 1st S, 4th Q, 19 to 24. — XII. 1st S, 2nd Q and 2nd C, 12 to 20; 36 to 45.

Cross-sections [see also e) "Tractional resistance of vessels" and "Traction and propulsion"].

I. 4th Q, 12. — II. 2nd S, 2nd Q, 3, 4. — VI. 1st S, 1st Q, 1 to 6. — XII. 1st S, 2nd Q, 12 to 20.

Defence of banks.

I. 7th Q. — IV. 1st S, 1st Q and 4th Q, 1, 15, 35. — V. 1st S. 1st Q, 1 to 4. — VI. 1st S, 1st Q, 1 to 3. — VII. 85. — VIII. 16. — IX. 140. — XII. 1st S, 2nd C, 36 to 45.

Management [see d) "*Ports*" and e) "*Traction and propulsion*"].

Water-supply of canals.

I. 13. — V. 1st S, 2nd Q, 5,6. — VI. 36. — VII. 2nd S, 4th Q, 30, 31. — VIII. 1st S, 2nd Q, 7 to 9. — IX. 1st S, 12th C, 49.

Prevention of leakage of the bed and banks of canals.

V. 1st S, 3rd Q, 7. — VI. 36. — VII. 2nd S, 3rd Q, 25 to 29. — VIII. 1st S, 2nd Q.

Reservoir dams.

V. 1st S, 4th Q, 8 to 13, 55. — VIII. 1st S, 2nd Q. — IX. 1st S, 1st C, 28.

Locks.

I. 4th and 9th Q. — II. 2nd S, 2nd Q, 3, 4. — IV. 1, 2. — IX. 6. — XII. 1st S, 2nd Q and 2nd C, 12 to 20, 36 to 45.

Locks with excessive fall, lifts and inclined planes.

I. 9th Q, 2, 5, 8. — R, 13, 14. — IV. 10,11. — IX. 1st S, 1st Q, 1 to 14. — IX. 143. — X. 1st S, 3rd Q, 15 to 26. — X. 128, 129, 135, 138, 139, 145.

Lock-gates.

VII. 2nd S, 2nd Q, 19 to 24. — VII. 80. — IX. 2nd S, 1st Q, 54 to 60.

Moveable bridges.

I. 6.

d) *Inland ports.*

Intermediary ports, termini, Harbours of refuge. Construction, maintenance, working (equipment, system of linking-up the railway and the ports).

II. 3rd S, 3rd Q, 5, 6. — V. 3rd S, 8th Q, 33 to 36. — VI. 1st S, 2nd Q, 4 to 6. — IX. 1st S, 6th, 7th and 13th C, 43, 44, 50. — X. 98. — XI. 1st S, 3rd Q, 14 to 18. — XII. 1st S, 3rd Q, 21 to 27.

e) *Matters relating to navigation.*

Tractional resistance of vessels. Shape of vessels and of the cross-sectional area of waterways.

V. 2nd S, 6th Q. — VI. 1st S, 1st Q, 1 to 3. — VI. 2nd S, 4th Q, 13, 14. — VI. 34. — VII. 1st S, 4th Q, 11 to 13. — VIII. 2nd S, 3rd Q, 10 to 12. — VIII. 14, 16, 21. — IX. 1st S, 5th C, 39 to 42. — X. 1st S, 4th Q, 27 to 29. — XII. 1st S, 3rd C, 46 to 51.

Traction and propulsion.

I. 8th Q, 7, 10, 11. — II. 3rd S, 3rd Q, 5, 6.— III. 3rd Q, 5, 6 — R. 12.— IV. 1st S, 1st Q, 1, 2, 6, 8, 12 to 14. — V. 6th Q, 19 to 26, 56, 57. — VI. 2nd S, 4th Q, 13 to 15. — VII. 2nd S, 1st Q, 14 to 18. — VII. 78, 79. — VIII. 2nd S, 3rd Q, 10 to 12. — VIII. 2nd S, 4th Q, 14 to 21. — VIII. 49 to 51. — IX. 17. — IX. 1st S, 2nd, 3rd, 4th C, 29 to 38. — IX. 53. — X. 1st S, 4th Q, 27 to 29. — X. 1st S, 2nd C, 32 to 39. — X. 124. — XI. 1st S, 2nd Q, 8 to 13. — XII. 1st S, 2nd Q, 12 to 20. — XII. 1st S, 3rd C, 46 to 51.

Delays and stoppages on canals and canalised rivers.

II. 5. — V. 2nd S, 5th Q, 14 to 18. — VI. 2nd S, 3rd Q, 7 to 12. — VIII. 44. (1st S, suppl.: quest.). — IX. 121.

Barges and lighters.

IX. 62, 63.

Tests made by means of small scale models. Hydrotechnic experiments [see 2° *Maritime Navigation.* A) *experiments* under letter a)].

III. 2nd Q, 3°. — VIII, 14, 21. — IX. 1st S, 5th C, 11th C, 39 to 41, 48. — IX. 98. — X. 141. — XII. 1st S, 1st Q.

f) *Hydrography. Hydrometry. Reinforced concrete, etc.*

Hydrography.

IV. 8. — IX. 1st S, 8th C, 45.

Hydrometry. Flood warnings.

XI. 1st S, 3rd C, 41 to 45.

Reinforced concrete (its use in hydraulic constructions).

XI. 1st S, 1st C, 30 to 36. — XII. 1st S, 1st C, 28 to 35.

Effects produced by the construction of canals on subterranean streams.

X. 1st S, 5th C, 44, 45.

Influence of the destruction of forests and the draining of marshes on the conditions of flow and discharge of rivers.

X. 1st S, 2nd Q, 7 to 14.

Preservation of low-lying districts from the effects of floods.

XI. 1st S, 5th Q, 25 to 29.

B) **Commercial, economic and social questions.**

Statistics of inland navigation. Principles on which they should be drawn up.

II. 1st S, 1st Q. — II. 8. — III. 1st Q, 1, 2. — IV. 2nd S, 3rd Q, 26 to 28.

Unification of the system of gauging tonnage on inland waters.

VI. 3rd S, 5th Q. — VII. 5th S, 2nd Q, 70, 71.

Economics of waterways.

I. 3. — II. 1st S, 1st Q, 1, 2. — II. 3rd S, 3rd Q, 5, 6. — III. 2nd and 5th Q, 3, 4, 9 to 12. — R. 1, 2, 7, 8. — IV. 2nd S, 4th Q, 29 to 37. — IX. 13th C, 50. — IX. 135. — X. 1st S, 1st Q, 1 to 6. — XI. 1st S, 4th Q, 19 to 24. — XII. 1st S, 1st Q.

Waterways and railways. (Their respective roles in the transport trade.)

I. 3. — II. 1st S, 1st Q, 1, 2. — IV. 35, 37. — V. 3rd S, 7th, 8th and 9th Q, 27 to 45. — IX. 119, 120, 126. — X. 1st S, 1st Q, 1 to 6. — XII. 48.

Taxes and Tolls. — Duties of the State.
I. 2nd and 3rd Q. — V. 3rd S, 7th and 8th Q, 27 to 36. — VI. 3rd S, 5th Q, 16 to 19. — IX. 1st S, 2nd Q, 15 to 23. — IX. 127, 139. — XI. 1st S, 2nd C, 37 to 40.

Traction monopolies. [see e) "Traction and propulsion"].

Coals. (Transport. Diminution of calorific value.)
V. 22. — IX. 1st S, 3rd Q, 24 to 27.

The mortgaging of waterways.
X. 1st S, 3rd C, 40 to 43.

Staff of the barge trade. (Provident and educational institutions. Sunday rest.)
VII. 92, 93. — VIII. 2nd S, 5th Q, 22, 23, 24. — VIII. 45, 52.

2° OCEAN NAVIGATION

A) Working and management.

a) *Tidal rivers.*

Improvements obtainable in tidal rivers, in their lower reaches, including the estuaries.
III. 4. — III. 6th Q, 13, 14. — I. M. 4, 9, 14, 18, 21, 22. — IV. 1st S, 2nd Q, 16 to 19. — V. 4th S, 10th Q, 46 to 54. — V. 58 to 61. — II. M. 5, 10. — VI. 38. — VII. 84. — IX. 2nd S, 11th C, 89.

Formulary of characteristic information as regards a tidal river.
VII. 3rd S, 1st Q, 32 to 37.

Measurement of the volume of tidal water.
VII. 3rd S, 2nd Q, 38 to 40.

Experiments by means of models regarding the improvement of estuaries and river mouths. [See 1° *Inland navigation.* A) *Experiments* c)].

III. 6th Q, 13, 14. — IV. 2nd Q, 16 to 18. — V. 4th S, 10th Q, 7° p. 67. — X. 58.

b) *Tideless rivers.*

Improvements obtainable in tideless rivers, in their lower reaches, including the estuaries.

III. 6th Q, 13, 14. — V. 4th S, 10th Q, 46 to 54. — X. 2nd S, 1st Q, 53 to 60.

c) *Ship-canals.*

Junction canals.

IV. 21, 22. — IX. 2nd S, 8th C, 86. — XII. 2nd S, 2nd Q, 62 to 69.

Canals penetrating inland.

I. 1st and 4th Q. — II. 4th S, 4th Q, 7. — III. 4th Q, 7, 8. — IV. 1st S, 2nd Q, 20 to 24. — IX. 2nd S, 7th C, 85. — XII. 2nd S, 2nd Q, 62 to 69.

Cross-sections.

I. 4th Q, 12. — VI. 1st S, 1st Q, 1 to 3. — XII. 2nd S, 2nd Q, 62 to 69.

Defence of the banks.

I. 7th Q, 20, 22. — VI. 1st S, 1st Q, 1 to 3. — VII. 3rd S, 3rd Q, 41 to 45.

Locks.

XII. 2nd S, 2nd Q, 62 to 69.

Lock gates [see d) *Sea ports.* "Lock gates"].

Moveable bridges [see d) *Sea ports.* "Moveable bridges"].

Management. [see e)].

IX. 86.

d) *Sea Ports.*

Lighting and buoying of the coast. Marine signals.

I. M, 12, 13. — II. M, 31 to 40. — VIII. 3rd S, 6th Q, 25 to 27. — IX. 2nd S, 2nd and 4th C, 75, 76, 81. — X. 2nd S, 6th C, 109 to 113. — X. 140. — XI. 124. — XII. 2nd S, 4th C, 110 to 118. — XII. 162.

Coast ports, maritime harbours, free ports, fishing ports, harbours of refuge for coasting vessels. Channels and outer-harbours.

I. M. 5 to 11, 14, 15. — II. M. 8 to 12, 14 to 24. — VII. 4th S, 3rd Q, 63. — VII. 72, 75, 78, 88. — VIII. 3rd S, 7th Q, 28 to 37. — VIII. 4th S, 8th Q, 38 to 40. — IX. 2nd S, 9th and 10th C, 87, 88. — X. 2nd S, 4th C. — X. 126. — XI. 2nd S, 1st, 2nd and 3rd Q and 4th C, 46 to 65, 90 to 95. — XII. 69. — XII. 2nd S, 3rd Q, 70 to 78. — XII. 2nd S, 2nd C, 89 to 101.

Piers, jetties, braekwaters.

I. M. 16, 20. — II. M. 1 to 4. — X. 2nd S, 4th Q, 74 to 82. — X. 143. — XII. 2nd S, 2nd C, 89 to 101.

Wharf and dock walls.

I. 6th Q. — I. M. 19. — VII. 74.

Locks.

XII. 2nd S, 2nd Q, 62 to 69.

Lock gates.

VII. 4th S, 4th Q, 64 to 66. — VII. 80. — IX. 2nd S, 1st Q, 54 to 60.

Moveable bridges, transporters, tunnels.

XII. 2nd S, 3rd C, 102 to 109.

Repairing plant. (Dry docks, floating docks, careening docks, etc.)

I. M. 3, 7, 8. — II. M. 14, 16 to 23. — IX. 2nd S, 3rd Q, 67 to 72. — IX. 93. — X. 104. — XI. 2nd S, 1st C, 76 to 82. — XII. 2nd S, 1st Q, 52 to 61.

Dredging. (Dredgers, rock breakers, submarine drills).
I. 5th Q. — IV. 19. — VII. 3rd S, 4th Q, 46 to 54. — IX. 2nd S, 1st, 3rd and 6th C, 73, 74, 77 to 80, 84. — X. 1st S, 6th C, 46 to 52. — X. 121. — XII. 2nd S, 1st C, 79 to 88. — II. M. 5, 13, 27.

Relative area of various parts of a harbourg.
VII. 4th S, 2nd Q, 59 to 62.

Wharehouses and Sheds.
VII. 4th S, 1st Q, 55 to 58.

Equipment. [see also «Coast harbours, etc.» above].
I. M. 1, 2, 6. — II. M. 14, 15. — VI. 1st S, 2nd Q, 4 to 6. VIII. 4th. S, 9th Q, 41. — XII. 2nd S, 3rd Q, 70 to 78.

e) *Matters relating to navigation.*

Tractional resistance of vessels in the open sea.
IX. 2nd S, 5th C, 82, 83.

Methods of propulsion.
X. 2nd S, 2nd Q, 61 to 67.

Sea-going barges, ferry boats, nautical stores.
II. M. 27. — VIII, 4th S, 8th Q, 38 to 40. — IX. 2nd S, 2nd Q, 61 to 66. — X. 2nd S, 2nd Q, and 3rd C, 61 to 67, 89 to 92. — XI. 2nd S, 2nd C. — XI. 115, 116. — XII. 2nd S, 2nd Q, 62 to 69.

Naval constructions.
II. M. 25, 26, 29, 30.

Liquid fuel.
X. 2nd S, 2nd C, 87, 88.

Safety of navigation.
XI. 2nd S, 4th Q, 66 to 71.

f) *Hydrography, reinforced concrete, materials.*

Hydrography.
XI. 2nd S, 5th Q, 72 to 76. — XI. 120, 122, 123.

Reinforced concrete. (its use for marine works).
X. 101, 103. — XI. 2nd S, 3rd C, 84 to 89. — XII. 2nd S, 2nd C, 89 to 101.

Cement, sand.
I. M. 17. — II. M. 6, 7.

B) **Commercial and economic questions.**

Utility of ship-canals.
I. 1st Q. — II. 4th S, 4th Q, 7. — III. 4th Q, 7, 8. — IX. 2nd S, 8th C, 86.

Taxes, tolls, wharf dues, method of collection.
VII. 5th S, 1st Q, 67 to 69.

Commercial working and management of waterways and sea ports.
IX. 2nd S, 8th C, 86. — X. 2nd S, 3rd Q, 68 to 73.

Petroleum (transport of).
II. M. 28.

Measures taken by various Governments to protect navigation.
X. 2nd S, 7th C, 114 to 118.

Responsibility of ship-owners as regards the public and public authorities.
X. 2nd S, 5th C, 106 to 108.

Maritime personel.
VII. 92, 93.

NOTE

This index of subject matter refers, as regards the subjects mentioned, to the reports which have been published at the meetings of the various Congresses, but in order to clearly understand the full scope of the questions which have been discussed, it is adviseable to refer to the "Reports of the Proceedings" in the case of each Congress which "reports" come under the head of "various publications" and whose classification is shown in the following table. This table has made it possible to avoid reproducing the reference numbers of these reports along side the corresponding Congress, each time it was mentioned.

Chronological order of the Congresses	Reference number of the Reports of the Proceedings	Chronological order of the Congresses	Reference number of the Reports of the Proceedings	Chronological order of the Congresses	Reference number of the Reports of the Proceedings
Ist Congress 1885	15, 16	IVth Congr. 1890	39, 40	VIIIth Congr. 1900	59 to 61
IInd Congr. 1886	11, 13	Vth Congr. 1892	64	IX Congr. 1902	153, 154
IIIrd Congr. 1888	16, 17	IInd M. 1893	41	Xth Congr. 1905	149 to 152
Ist M. 1889	23	VIth Congr. 1894	40, 41	XIth Congr. 1908	152, 153
Ist R. 1889	15	VIIth Congr. 1898	100 to 102	XIIth Congr. 1912	190, 191

J. RICHALD.

ADDENDA

A. – Regulations of the Permanent International Association of Navigation Congresses. Edition of 1913. (Page 323.)

B. — Permanent International Commission of the Navigation Congresses. (Page 336.)

C. — Permanent Council of the International Commission. (Page 347.)

D. — States subscriving to the Permanent International Association of Navigation Congresses. (Page 353.)

ADDENDA

A

Permanent International Association

OF

NAVIGATION CONGRESSES

REGULATIONS

EDITION OF 1913

I. — Object and Organization of the Association.

ARTICLE 1.

The object of the Permanent International Association of Navigation Congresses is to promote the progress of inland and maritime navigation.

It continues the work carried out by twelve International Congresses (1), the last of which was held at Philadelphia in May 1912.

It accomplishes its object :

1. By organizing Navigation Congresses;

2. By publishing Papers, Proceedings, and various other documents.

---

(1) Namely : I. Brussels, 1885. — II. Vienna, 1886. — III. Frankfort on the Main, 1888. — IV. Manchester, 1890. — V. Paris, 1892. — VI. The Hague, 1894. Inland navigation alone was the object of these six Congresses. VII. Brussels, 1898. — VIII. Paris, 1900. — IX. Düsseldorf, 1902. — X. Milan, 1905.— XI. St. Petersburg, 1908.— XII. Philadelphia 1912. These latter Congresses considered navigation in general (inland navigation and ocean navigation).

A River-Water Utilization Congress was held in Paris in 1889. Two Maritime Works Congresses have been held, the first in Paris in 1889, the second in London in 1893.

Its transactions are of an international character.

Its affairs are managed by a **Permanent International Commission.**

ART. 2.

The Association consists of :

1. *Delegates* of those Governments and Corporations which grant an annual subsidy to the Association;

2. Private Members.

Membership may be either *permanent* or *temporary*.

Permanent Members may redeem their annual fees by a single payment.

Governments may appoint one *official delegate*, having a right to vote at every Congress, for each 250 francs of their annual subsidy.

This figure is reduced to 100 francs in the case of Corporations.

Permanent Members are entitled to attend and vote at every Congress.

Temporary Members are allowed to attend the Congress for which they have been enrolled;

3. *Honorary Members*, nominated by the International Commission.

ART. 3.

1. At the head of the Association there is a **Permanent International Commission,** having its headquarters at Brussels.

2. From amongst the Members of this Commission, a **Permanent Council** and an **Executive Committee** have been constituted.

3. It devolves on each country, whenever occasion arises, to fill vacancies occurring amongst its representatives on the Commission or Permanent Council, through death, or by the expiration of their term of office.

ART. 4.

The Permanent International Commission is composed of members belonging to the various countries represented on the Association. Each country is entitled to one representative for each 1000 francs of its total annual contribution.

The number of representatives of a country however shall not exceed ten, and a country which does not pay less than 250 francs is entitled to one delegate.

In addition, the General Secretaries of the Navigation Congresses are de jure members of the Permanent Commission.

This Commission:

1. Determines the time and place of the next Congress;

2. Arranges, in due time, in the place selected, the formation of a Local Organizing Commission.

3. After consultation with the Organizing Commission, determines the questions to be laid before and the communications to be made to the Congress; arranges the business of the Meetings; and appoints writers of Papers on the several questions.

4. Gives its support, when necessary, to the Local Commission in applying to foreign Governments.

5. Approves the estimates of expenses to be defrayed out of the permanent resources of the Association; supervises the financial management; and decides, generally, upon all the administrative measures and clauses of by-laws which it deems of service to the work of the Congress.

6. Nominates Honorary Members.

The Commission meets whenever it is summoned by the Executive Committee, or upon the requisition of a quarter of its members.

ART. 5.

The Permanent Council is composed of representatives chosen from among the members of the Permanent Commission, viz: one for each country of which the annual subsidy does not exceed 5,000 francs; two for each of those countries of which the annual subsidy is greater than this figure.

The Permanent Council:

1. Carries out the resolutions of the International Commission, and decides all questions not expressly reserved for the decision of the Commission.

2. Decides upon the admission of Permanent Members and Corporations referred to in Article 2.

3. Draws up the estimates to be defrayed out of the permanent resources of the Association, and assists and controls the Executive Committee.

4. Forms a part of the Committee of each Congress (called the General Presiding Committee) and prepares, in connection with the local Committee of Organization, the lists of the persons to be invited to form : *a*) this Committee of the Congress; *b*) the Sectional Committees.

5. The Council meets whenever summoned by the Executive Committee, or upon the request of a quarter of the Members of the Council.

Any member of the Permanent Council who may be prevented from attending one of our meetings, may have himself replaced there by another representative of his country who is a member of the Permanent Commission.

ART. 6.

The Executive Committee is composed of two *Presidents and a General Secretary*, who may be assisted by Secretaries specially entrusted with the translations into the German and English languages, and also by an accountant.

1. The Executive Committee attends to the despatch of current business, keeps the accounts, prepares the estimates of expenses to be defrayed out of the permanent resources of the Association, keeps the expenditures within the limits of each division of the approved estimates, signs orders, and collects the subscriptions and all other sums due to the Association.

2. It deals with all investigations, records, and publications decided upon by the Permanent Council or the International Commission. It has charge of the library, archives, and documents.

3. It translates, when necessary (provided the authors do not desire to undertake the task), publishes, and transmits to the Members of the Congress all reports, papers, and proceedings of the Congress.

4. It places on deposit in the Belgian State Bank the funds of the Association, and represents the latter in legal proceedings.

ART. 7

1. **A Local Organizing Commission** is formed to make the necessary preparations for each Congress, and holds office till the close of the Congress.

2. This Commission also includes, committees of patronage, administration, receptions, excursions, etc.

3. It takes steps to make the Association more generally known and, in accord with the Permanent Council, selects the persons of the country who are to be invited to preside over or to become members of the Committee of the Congress and the Committees of the Sections.

4. It draws up, in consultation with the Permanent Council, the détailed programme of the disposition of the time and arranges for its distribution to all the Members of the Congress at the opening of the Meeting

5. It organizes the various excursions, receptions, and festivities.

6. It provides the rooms in which the Meetings are held.

7. It organizes the service of correspondence, accommodation, interpreters, translators into the language of the country, and, if necessary, translations into and printing in this language of Papers written in one of the three languages of the Congress — English, French, or German, — and, reciprocally, the translation into any of these three languages of Papers written in the language of the country.

8. It places the Permanent Commission in communication with the local authorities.

9. It presides over, and conducts the Session of the Congress.

10. It defrays the expenses of the Congress by means of the subscriptions of the temporary members, fixed at 25 francs, equivalent to £ 1 or $ 5, other special grants, and, if required, a subsidy given by the Association.

11. It has to keep a special account of the expenses chargeable to the Association, and shall not, without the authority of the Executive Committee, incur any expense on account of the Association, beyond the aforesaid subsidy.

ART. 7*a*.

The **Committee** of the **Congress** as well as those of the **Sections** are constituted in accordance with stipulations Article 5, n° 4, and Article 7, n° 3.

COMMITTEE of the CONGRESS. — This Committee also called the General Presiding Committee, is composed of :

1. One Chairman, or two Chairmen, and also one chief Secretary belonging to the country where the Congress is held.

2. The chief delegates of each country represented at the Congress. The same will hold the office of Vice-Chairmen.

3. The Permanent Council of the Association, and also the former Chief Secretaries of Navigation Congresses attending the Congress.

4. Secretaries, in no case exceeding the number of ten.

SECTIONAL COMMITTEES. — Each Committee comprises :

1. One Chairman, or two Chairmen, and also two Secretaries belonging to the country where the Congress is held.

2. Three Vice-Chairmen and also three Secretaries acquainted with at least two of the ordinary Congress languages, and who are selected by the Permanent Commission.

3. One Vice-Chairman for each country officially represented at the Congress, whose annual subsidy attains the sum of 2,000 Francs, and whose fellow-countrymen have presented one or more Reports, on the Questions to be discussed at the Section.

Each of the latter Vice-Chairmen may be assisted by a member of the Congress as Secretary.

In case he should be prevented from attending, he may be replaced by a substitute designated by the Delegation of his country.

ART. 8.

The permanent resources of the Association are derived from :

1. The annual grants from Governments and Corporations.
2. The subcriptions of Permanent Members (see Article 2).

Permanent membership involves a yearly subscription of ten francs, equivalent to eight shillings, or two dollars.

An entrance subscription of twenty-five francs, equivalent to one pound sterling or five dollars, is required for the first year, in the case of Permanent Members who are admitted during a Congress year.

Permanent Members may redeem their annual fees and become " Life Members " by a single payment of 125 francs, equivalent to 5 pounds sterling or 25 dollars. This option, however, does not apply to Corporations.

Honorary Members do not pay any subscription.

3. Various donations and gifts.

ART. 9

1. The financial year commences on the first day of January.

2. Subscriptions are payable as follows :

For *permanent Membership* : at the time of admission, and on the first of January of each forthcoming year, to the Office of the Executive Committee.

For *temporary Membership* : at the time of admission, to the Office of the Local Organizing Commission.

The expenses of collection are to be borne by the Members.

Contributions may be asked for by the Local Organizing Commission from the Members taking part in the excursions and entertainments during the Congress. Participation in these is optional.

ART. 10.

Every *Member* is entitled :

1. To take part in the Meetings of the Congress.

2. To receive the publications of the Congress, in any one of the three languages of the Congress : *English, French, or German*, which he may select; the Association is not bound, however, to supply copies in place of those lost or damaged in transit.

Permanent and Honorary Members are further entitled :

a) To lay before the Permanent Commission questions to be submitted to the Congress. Such questions, accompanied by a

concise report giving reasons for the same, must reach the Commission at least one year before the Meeting of the Congress.

b) To vote at the meetings of the Congress.

c) To receive the publications distributed by the Association at other times than during the sessions of the Congress.

For each 125 francs, equivalent to 5 pounds sterling or 25 dollars, of their annual subsidies the Governments are entitled to receive a set of the publications. This figure is reduced to 100 francs, equivalent to 4 pounds sterling or 20 dollars, for Corporations.

Each Government or Corporation, whatever be the amount of its contribution, receives at least one copy of the publications.

II. — Session of the Congress.

ART. 11.

The Permanent Commission convenes the Congress from time to time, at intervals of about three years, as nearly as possible.

ART. 12.

1. The Congress comprises :

Two Sections, one for *Inland Navigation*, and the other for *Maritime Navigation*. These Sections may be subdivided.

2. Its proceedings consist of General Meetings, Sectional Meetings and Excursions.

The number of Questions to be submitted to the deliberations of a Congress should be limited, so far as possible, to three for the Inland Navigation Section and to three for the Maritime Navigation Section. The same rule applies to the Communications.

As a general rule each country will furnish but one Paper on any given Question or Communication.

ART. 13.

The reporter, or reporters, selected by the Commission for a Question or Communication and for a given country, will collect in that country all the elements needed for the preparation of their Paper.

Their work, supported by conclusions if they deem these desirable, should reach the Executive Committee, at the latest, *eight months before the opening of the Congress.*

The Permanent Commission appoints a *General Reporter for each Question*, to whom is entrusted the duty of presenting a short review to the Congress on the several points of the Question, and also an analysis of the Papers transmitted to him.

The *General Reporter* may give his own views, and personal information, and arrange with the different writers of Papers for formulating joint proposals.

ART. 14.

The Papers upon each " Question ", and also the General Reports must be forwarded to the Executive Committee within the limit of time allowed to their Authors; they are translated and printed in the three languages of the Congress.

The manuscripts shall be transmitted to the General Secretary in English, French or German, copied on one side only of the paper and, as far as possible, *type-written.*

It is also decided that the total number of pages of each paper is limited to 20, of about 400 words, including drawings.

In order to allow, in case of necessity, of the reproduction of plates, they should be drawn on tracing paper with clear, sharp black lines.

Except in special cases, the number of plates is limited to two. The sheet, including the border, should not be more than 24 centimetres in width and 55 centimetres in length (=9.80 in. × 21.65 in.), or 22 cm. × 52 cm. (=8.66 in. × 20.47 in.), inside of the border.

The *Communications* are not submitted for discussion until after the programme of the *Questions* has been concluded, and then only provided that time permits.

These Communications are classified as follows :

Those which, on account of their general interest, are printed at the expense of the Association, and those which are printed at the expense of their Authors : in this latter case the requisite number of copies has to be furnished to the Executive Committee.

They are not voted upon, nor are they brought up for consideration at a general Meeting.

Writers of Papers upon *Questions*, or of *Communications*, may, if they wish, furnish translations themselves of their Papers in the several languages of the Congress.

ART. 15.

The *Questions* are first discussed at the Sectional Meetings, and afterwards at a General Meeting.

ART. 16.

1. The deliberations, either at General Meetings or at Sectional Meetings, are conducted in the three languages of the Congress, and also, when required, in the language of the country where the Congress is held.

2. Unless otherwise decided by the Meeting, persons taking part in the discussions, are not allowed to speak for more than fifteen minutes, nor can they address the same Meeting more than twice upon the same subject.

ART. 17.

Members of the Congress who have spoken at a Meeting, must, within twenty-four hours, deliver to the Sectional Committee a résumé of their remarks, to enable a report of the proceedings to be drawn up.

The Committee shall have the right to request the author to abridge his résumé; and should it not have been revised and amended in due time, the Committee will undertake the abridgment.

ART. 18.

The résumé of the discussions, arranged and edited by the Sectional Committees, together with the several conclusions adopted by the majority of the Members voting, are transmitted

by the General Reporter to the Permanent Council the day before the last General Meeting; they are then laid before the latter where they are discussed and voted upon.

ART. 19.

A detailed report of the proceedings of each Section of the Congress is prepared and furnished, within three months after the date of the closing of the Congress, to the Executive Committee by the Committee of the Congress, assisted by the Vice-Presidents and Secretaries of the Sections.

As regards the General Meetings and excursions, a similar report is prepared, within the time stated, by the General Secretary of the Session.

The joint record so compiled is published in the three languages under the direction of the Executive Committee.

III. — Dissolution of the Association.

ART. 20.

The Association can only be dissolved at a Congress specially summoned for this purpose, and if approved by a majority of three-fourths of the Members present entitled to vote.

ART. 21.

1. In the event of its dissolution, the liquidation of the accounts of the Association shall be entrusted to the Permanent Commission.

2. Under its guidance, the final assets of the Association shall be devoted to philanthropic objects relating to navigation.

INDEX

REGULATIONS

I. — Object and Organization of the Association

Pages

ARTICLE 1. — Object. Management of the Association 323
ARTICLE 2. — Composition of the Association. Delegates of Governments and Corporations Permanent or Temporary Members, Honorary Members 324
ARTICLE 3. — Permanent International Commission. Permanent Council. Executive Committee 324
ARTICLE 4. — Permanent Commission. Composition and duties. . 324
ARTICLE 5. — Permanent Council. Composition and duties. . . . 325
ARTICLE 6. — Executive Committee. Composition and duties. Languages of the Association (English, French, German) 326
ARTICLE 7. — Local Organizing Commission. Object and duties. 327
ARTICLE 7a. — Composition of the Committee of the Congres and of the Sectional Committee. 328
ARTICLE 8. — Permanent resources of the Association. Subsidies, subscriptions, donations and gifts. 328
ARTICLE 9. — Mode of payment of subscriptions 329
ARTICLE 10. — Rights of Members. Rights reserved to Permanent and Honorary Members, as well as to Governments and Corporations. (See also Article 2). 329

II. — Session of the Congress

ARTICLE 11. — Meeting of the Congress 330
ARTICLE 12. — Sections of the Congress. General Meetings and Sectional Meetings. Questions and Communications. 330
ARTICLE 13. — Reporters. General Reporters 330
ARTICLE 14. — Reports. General Reports. Conditions to be fulfilled. Differentiation between « Questions » and « Communications » . . . . . , 331

ARTICLE 15. — Questions. Discussion at Sectional Meetings and at General Meetings 332
ARTICLE 16. — Languages admitted in deliberations. Time allowed to speakers 332
ARTICLE 17. — Minutes. Regulations to be observed by the speakers concerning the résumé of their communications. . 332
ARTICLE 18. — Final General Meeting. Discussion and Votes . . 332
ARTICLE 19. — Reports in three Languages (English, French, German) of the proceedings of the General Meetings, the Sectional Meetings and the excursions. 333

III. — Dissolution of the Association

ARTICLE 20. — Conditions requisite for the dissolution 333
ARTICLE 21. — Liquidation 333

Permanent International Commission

OF NAVIGATION CONGRESSES

Presidents :

Executive Committee

HELLEPUTTE (Georges), Ingénieur honoraire des Ponts et Chaussées, Ministre de l'Agriculture et des Travaux Publics, Ministre d'Etat, Membre de la Chambre des Représentants, Bruxelles.

DUFOURNY (Alexis), Inspecteur général des Ponts et Chaussées, Directeur général des Voies hydrauliques, Bruxelles.

General Secretary :

RICHALD (Joseph), Ingénieur principal des Ponts et Chaussées, Professeur à l'Université de Gand, Bruxelles.

General Secretaries of Congresses :

I. Brussels 1885 GOBERT, Ingénieur honoraire des Mines, Bruxelles;

II. Vienna 1886 X...;

III. Frankfort 1888 LINDLEY (Sir William H.), M. Inst. C. E., Civil Engineer, Frankfort-on-Main;

IV. Manchester 1890 Marshall STEVENS, F. S. S., Manchester;

V. Paris 1892 BARLATIER DE MAS (Fernand), Inspecteur général des Ponts et Chaussées en retraite, ancien Professeur à l'Ecole Nationale des Ponts et Chaussées, Lyon;

VI. The Hague 1894 ASSER, (E.-L.), Ingénieur en chef des Chemins de fer hollandais (deceased);

VII. Brussels 1898 DUFOURNY (Alexis), Inspecteur général des Ponts et Chaussées, Directeur général des voies hydrauliques, Bruxelles;

VIII. Paris 1900 PAVIE (Georges), Ingénieur en chef des Ponts et Chaussées, Paris;

IX. Dusseldorf 1902 SYMPHER (Léo), Geheimer Oberbaurat, Vortragender Rat im Ministerium der öffentlichen Arbeiten, Berlin;

X. Milan 5 SANJUST DI TEULADA (E.), Inspecteur supérieur du Génie civil, Président de la Soc. des Ingénieurs et Architectes italiens, Député au Parlement, Rome.

XI. St-Petersbourg 1908 DE TIMONOFF (V.-E.), Ingénieur des Voies de Communication et des Constructions Civiles, Conseiller privé, Professeur à l'Institut des Ingénieurs des Voies de communication, Membre du Conseil des Ingénieurs et Directeur de la Statistique et de la Cartographie au Ministère des Voies de Communication, Membre du Conseil Technique au Ministère du Commerce et de l'Industrie, Membre du Conseil Statistique de l'Empire, Président du Comité Hydrologique, Saint-Pétersbourg;

XII. Philadelphia 1912 SANFORD (J.-C.), Lieut.-Colonel, Corps of Engineers, U. S. Army, Detroit, Mich.

Members :

Algeria

VIELLE, Ingénieur en chef des Ponts et Chaussées, Adjoint technique à la Direction des Travaux Publics au Gouvernement général de l'Algérie, Alger.

Argentina

BUSTOS MORON (H.), Ingénieur, Buenos-Ayres;

SPELUZZI (Emilio), Ingénieur en chef, Ministère des Travaux Publics, Buenos-Ayres.

Austria-Hungary

Austria

RUSS (Dr. Victor), k. k. Geheimer Rat, Exzellenz, Mitglied des österreich. Herrenhauses, Präsident der öst. Nordwest-Dampfschiffahrt Gesell., Wien;

KAUTZKY (Dr Heinrich), Sektionsrat, Leiter des Binnenschifffahrts-Departement im k. k. Handelsministerium und Vorstand der Administrativen Abteilung der Direktion für den Bau der Wasserstrassen, Wien;

KUHN (Richard), k. k. Hofrat, Vorstand des Hydrotechnischen Bureaus im k. k. Handelsministerium, Wien I.

MATHEUSCHE (Herman), Dr. Hofrat, Director der k. k. Lagerhäuser, Triest.

Hungary

DE KVASSAY (Eugène), Conseiller ministériel, Chef de la Direction royale hongroise des Eaux, Ministère de l'Agriculture, Budapest;

HOSZPOTSKY (Aloyse), Conseiller ministériel au Ministère du Commerce, Budapest.

Belgium

VANDERLINDEN (Jean, Florimond), Inspecteur général des Ponts et Chaussées, Administrateur-Inspecteur de l'Université de Gand, Gand;

VAN GANSBERGHE (Louis), Inspecteur général des Ponts et Chaussées, Bruxelles;

MAILLIET (Toussaint, Valérie), Directeur général honoraire des Ponts et Chaussées, Bruxelles;

TROOST (J., L.), Directeur général honoraire des Ponts et Chaussées, Bruxelles;

PIERROT (Jean, Arnold), Inspecteur général honoraire des Ponts et Chaussées, Directeur général honoraire à l'Administration centrale de Bruxelles;

LAGASSE DE LOCHT (Charles), Directeur général honoraire des Ponts et Chaussées, Bruxelles;

LAMBIN (Albert Ingénieur en chef, Directeur des Ponts et Chaussées, Chef du Cabinet du Ministre de l'Agriculture et des Travaux publics, Bruxelles.

Brazil

DE SILVEIRA BULCAO (José, Fortunato), Consul général, Anvers;

DE SOUZA BANDEIRA (Manuel), Ingénieur civil, Sous-Inspecteur de l'Inspection fédérale des ports, fleuves et canaux, Rio de Janeiro.

Bulgaria

MORFOFF (B.), Ingénieur, Directeur général des Chemins de fer de l'Etat Bulgare, à Sofia.

Canada

HAZEN (Hon. John Douglass), Minister of Marine and Fisheries, Ottawa.

Chili

MUNOZ HURTADO (Joaquim), Admiral, Chief of the Chilian Naval Commission, Londres.

China

HIANGHIENG, LI, Premier Secrétaire de la Légation de la République Chinoise, Bruxelles.

Danube (Europ. Comm.)

President of the Commission (Delegate from Germany or France).

Denmark

WESTERGAARD (Viggo), Directeur des Travaux Maritimes de l'Etat Danois, Copenhague.

France

CHARGUÉRAUD (André), Conseiller d'Etat, Inspecteur général des Ponts et Chaussées, Directeur des Routes et de la Navigation au Ministère des Travaux Publics, Paris;

GUÉRARD (M.-N. Adolphe), Inspecteur général des Ponts et Chaussées, Paris;

JUNCKER, Inspecteur général des Ponts et Chaussées en retraite, Paris;

RÉSAL, Inspecteur général des Ponts et Chaussées, Paris;

CRAHAY DE FRANCHIMONT (Henri), Inspecteur général des Ponts et Chaussées, Membre de la Commission internationale consultative du canal maritime de Suez, Paris;

DE JOLY (Georges), Ingénieur en chef des Ponts et Chaussées, Professeur à l'Ecole Nationale des Ponts et Chaussées, Paris;

DABAT, Directeur général des Eaux et Forêts au Ministère de l'Agriculture, Paris;

JOUANNY, Membre de la Chambre de Commerce de Paris, Président de la Commission des voies et moyens de cette Chambre, Secrétaire général de l'Association française des Congrès Nationaux de Navigation Intérieure, Paris;

REUMAUX, E., Ancien Président de la Société des Ingénieurs civils de France, Directeur Général de la Soc. des Mines de Lens, Membre du Syndicat de la Marine (Navigation Intérieure), Lens (Pas-de-Calais);

FOUGEROLLES, Ancien Président du Syndicat professionnel des Entrepreneurs de Travaux publics de France, Paris.

French West-Africa

BOUTTEVILLE (H.-G.), Inspecteur Général des Ponts et Chaussées, Inspecteur Général des Travaux Publics des Colonies, Paris.

Germany

FREIHERR FRANZ VON COELS VON DER BRÜGGHEN, Unterstaatssekretär im Ministerium der öffentlichen Arbeiten, Berlin;

VON DŒMMING (Albert), Ministerial- und Oberbaudirektor im Ministerium der öffentlichen Arbeiten, Berlin;

KRAUSE (Dr), Geheimer Justizrat, Zweiter Vizepräsident des Preussischen Hauses der Abgeordneten, Berlin;

VON SCHUH (Georg). Dr. Jur, Oberbürgermeister, Kgl. Geheimer Rat, Nürnberg;

BUBENDEY (J. F.), Wasserbaudirektor der freien und Hansestadt Hamburg, Geheimer Baurat, Hamburg;

FLAISCH, Wasserbautechnischer Referent im Ministerium für Elsass-Lothringen, Strassburg;

DE THIERRY (Georg), Geheimer Baurat, Professor an der Techn. Hochschule, Membre de la Commission consultative du Canal de Suez, Berlin-Halensee;

ENGELS (Hubert), Geheimer Hofrat, Professor, Dresden;

HEINEKEN, Vorsitzender des Direktoriums des Norddeutschen Lloyds, Bremen;

LUTJOHANN, Kaiserlicher Regierungsrat, Kiel.

Great Britain

HERTSLET (Sir CECIL), His Majesty's Consul General for Belgium, Antwerp;

YORKE (Sir H. A.), Lieutenant-Colonel, Chief Government Inspector of Railways, London.

Greece

EMBIRICOS, ancien Ministre de la Marine, Athènes;

TYPALDO-BASSIA, Ancien Président intérimaire du Parlement, Membre de la Cour internationale permanente d'Arbitrage, Athènes.

Indo-China

BOUTTEVILLE (X.), Inspecteur Général des Ponts et Chaussées, Inspecteur Général des Travaux Publics des Colonies, Paris.

Italy

TORRI (Albert), Inspecteur général du Génie Civil, Rome;

ROTA (Guiseppe), Colonel du Génie naval, Directeur des Constructions navales de l'Arsenal Royal, Spezia.

Japan

MASACHIKA (Kubato), Directeur Général des Ponts et Chaussées, Tokio;

JUKAWA MOTOOMI, Directeur au Bureau de la Marine marchande au Ministère des Communications, Tokio;

SIMITARO (Maruyama), Capitaine de Frégate, Attaché naval à l'Ambassade du Japon, Paris;

ISHIBASHI AYASHIKO, Kogaku-hakushi, Ingénieur au Ministère des Communications, Tokio;

OKINO TADAO, Kogaku-hakushi, Ingénieur du Ministère des Communications, Tokio;

TAKEDA, Kantaro, Ingénieur du Ministère des Communications, Tokio.

Mexico

SALAZAR (Louis), Ingénieur, Directeur de l'Ecole nationale des Ingénieurs, Sous-Directeur des Travaux publics du District Fédéral, Mexico.

Monaco

BATARD-RAZELIÈRE, Ingénieur en chef des Ponts et Chaussées, Ingénieur en chef des travaux du port de Monaco, Marseille.

Netherlands

VAN DER SLEYDEN (Ph. W.,), ancien Ministre du Waterstaat, du Commerce et de l'Industrie, La Haye.

DEKING DURA (Adrianus), ancien Ingénieur en chef du Waterstaat de la Province d'Overijssel, La Haye.

Norway

KRISTENSEN (Ingvar), Direktor der Wasserstrassen, Christiania.

Persia

AERTS, Alphonse, Courtier maritime, à Anvers.

Peru

Consul Général du Pérou, Anvers.

Portugal

ROLDAN Y PEGO (Manuel), Ingénieur des Mines, Chef de la Circonscription minière du Sud, Lisbonne.

Roumania

SALIGNY, Inspecteur général et Directeur général du Service hydraulique, Bucarest.

Russia

Le Prince V. N. SHAHOVSKOI, Chambellan de S. M. l'Empereur de Russie, Conseiller d'Etat, Directeur de la navigation intérieure et des Routes au Ministère des Voies de Communication, à Saint-Pétersbourg;

MAXIMOVITCH, N. I. (Excellence), Conseiller privé, Ingénieur, Membre du Conseil supérieur technique des Ingénieurs au Ministère des Voies de Communication, Saint-Pétersbourg;

FLORINE (A.-V.), Conseiller d'Etat actuel, Directeur des Ports de Commerce et de l'Industrie, Ingénieur des Voies de Communication, Saint-Pétersbourg;

DE HOERSCHELMANN (Emile), Conseiller privé, Membre du Conseil des Ingénieurs au Ministère des Voies de Communication, Tsarskoïë-Selo, près Saint-Pétersbourg;

DE SCHOKALSKY, Lieutenant Général, Collaborateur honoraire de l'Administration Générale de l'Hydrographie, Saint-Pétersbourg;

ALTFATER, Capitaine-Lieutenant de vaisseau de la Marine Impériale de Russie, Saint-Pétersbourg;

KLEIBER (W.-H.), Conseiller d'Etat actuel, Ingénieur des Voies de Communication, à Saint-Pétersbourg.

MAXIMOFF (Serge), Ingénieur des Voies de Communication, Directeur adjoint de l'Hydraulique Agricole, Conseiller d'Etat, Saint-Pétersbourg;

Servia

CASSEL (Léon), Consul général, Bruxelles.

Siam

DU PLESSIS DE RICHELIEU (Phya Cholaynt Yothin) (Andreas), Vice-Amiral, Copenhague.

Spain

ARENAL (Fernando Garcia), Inspecteur général des Routes, Canaux et Ports, Madrid;

ORTUNO (Emilio), Ingénieur, Directeur général des Postes et Télégraphes, Madrid;

BROCKMANN (Guillermo), Ingénieur en chef du Service des Signaux maritimes, Madrid.

Suez Canal — (International Company)

QUELLENNEC (E.), Ingénieur en chef des Ponts et Chaussées, Ingénieur-Conseil de la Compagnie du Canal de Suez, Paris.

Sweden

HANSEN (Fredrik-Wilhelm), Colonel, Président de l'Administration royale des Forces motrices hydrauliques, Stockholm.

Switzerland

DE MORLOT (Albert), Inspecteur fédéral en chef des Travaux publics de la Confédération suisse, Berne.

Tunis

MICHAUX, Directeur général des Travaux Publics de Tunis, à Tunis.

Turkey

ISMAIL NAZIM BEY, Secrétaire de la Légation Impériale ottomane, Bruxelles.

United States

BIXBY (W. H.), Brigadier General and Chief of Engineers, U. S. Army, Washington D. C.;

HODGES (Harry F.), Colonel, Corps of Engineers of the United States Army, Assistant Chief Engineer, Isthmian Canal Commission, Culebra C. Z. Panama;

CORTHELL (Elmer Lawrence), Civil Engineer, New York;

BOGART (John), Colonel, Consulting Engineer, New York;

Hon. HAMPTON MOORE (Joseph), Member of U. S. Congress, Philadelphia Pa.

Uruguay

JOSÉ M. MONTERO Y PAULLIER, Consul général de l'Uruguay en Espagne, Madrid.

C

Permanent Council of the International Commission

Executive Committee

Presidents :

HELLEPUTTE (Georges), Ingénieur honoraire des Ponts et Chaussées, Ministre de l'Agriculture et des Travaux Publics, Ministre d'Etat, Membre de la Chambre des Représentants, Bruxelles;

DUFOURNY (Alexis), Inspecteur général des Ponts et Chaussées, Directeur général des Voies hydrauliques, Bruxelles.

General Secretary :

RICHALD (Joseph), Ingénieur principal des Ponts et Chaussées, Professeur à l'Université de Gand, Bruxelles.

Members :

Algeria

VIELLE, Ingénieur en chef des Ponts et Chaussées, Adjoint technique à la Direction des Travaux Publics au Gouvernement général de l'Algérie, Alger.

Argentina

BUSTOS MORON (H.), Ingénieur, Buenos-Ayres.

Austria-Hungary

Austria

RUSS (Dr. Viktor), k. k. Geheimer Rat, Excellenz, Mitglied des österreich. Herrenhauses, Präsident der österr. Nordwest-Dampfschiffahrt Gesell., Wien.

Hungary

DE KVASSAY (Eugène), Conseiller ministériel, Chef de la Direction royale hongroise des Eaux, Ministère de l'Agriculture, Budapest.

Brazil

DE SILVEIRA BULCAO (José, Fortunato), Consul général, Anvers.

Bulgaria

MORFOFF (B.), Ingénieur, Directeur général des Chemins de fer de l'Etat bulgare, Sofia.

Canada

HAZEN (Hon. John Douglas), Minister of Marine and Fisheries, Ottawa.

Chili

MUNOS URTADO (Joaquim, C. N. Rear), Admiral, Chief of the Chilian Naval Commission, Londres.

China

HIANGHIENG LI, Premier Secrétaire de la Légation de la République chinoise, Bruxelles.

Denmark

WESTERGAARD (Viggo), Directeur des Travaux maritimes de l'Etat, Copenhague.

France

CHARGUÉRAUD (André), Conseiller d'Etat, Inspecteur général des Ponts et Chaussées, Directeur des Routes et de la Navigation, Paris;

GUÉRARD (M. N. Adolphe), Inspecteur Général des Ponts et Chaussées, Paris.

French Western Africa

BOUTTEVILLE (H.-X.), Inspecteur Général des Ponts et Chaussées, Inspecteur Général des Travaux publics des Colonies, Paris.

Germany

FREIHERR VON COELS VON DER BRÜGGHEN, Unterstaatssekretär im Ministerium der öffentlichen Arbeiten, Berlin;

SYMPHER (Leo), Geheimer Oberbaurat, Vortragender Rat im Ministerium der öffentlichen Arbeiten, Berlin.

Great Britain

HERTSLET (Sir CECIL), His Majesty's Consul general for Belgium, Antwerp.

Greece

TYPALDO-BASSIA, Ancien Président intérimaire du Parlement, Membre de la Cour internationale permanente d'Arbitrage, Athènes.

Indo-China

BOUTTEVILLE (X.), Inspecteur Général des Ponts et Chaussées, Inspecteur Général des Travaux publics des Colonies, Paris.

Italy

TORRI (Albert), Inspecteur Général du Génie Civil, Rome.

Japan

SIMITARO, Maruyama, Capitaine de Frégate, Attaché naval à l'Ambassade du Japon, Paris.

Mexico

SALAZAR (Louis), Ingénieur, Directeur à l'Ecole Nationale des Ingénieurs, Sous-Directeur des Travaux publics du District Fédéral, Mexico.

Monaco

BATARD-RAZELIÈRE, Ingénieur en chef des Ponts et Chaussées, Ingénieur en chef des travaux du port de Monaco, Marseille.

Netherlands

VAN DER SLEYDEN (Ph. W.,), ancien Ministre du Waterstaat, du Commerce et de l'Industrie, La Haye.

Norway

KRISTENSEN (Ingvar), Director of Waterways, Christiania.

Persia

AERTS, (Alphonse), Courtier maritime, Anvers.

Peru

Consul Général du Pérou, Anvers.

Portugal

ROLDAN Y PEGO (Manuel), Ingénieur des Mines, Chef de la Circonscription minière du Sud, Lisbonne.

Roumania

SALIGNY, Inspecteur général et Directeur général du Service Hydraulique, Bucarest.

Russia

DE TIMONOFF (Excellence), Ingénieur des Voies de Communication et des Constructions Civiles, Conseiller privé, Professeur à l'Institut des Ingénieurs des Voies de Communication, Membre du Conseil des Ingénieurs et Directeur de la Statistique et de la Cartographie au Ministère des Voies de Communication, Membre du Conseil Technique au Ministère du Commerce et de l'Industrie, Membre du Conseil Statistique de l'Empire, Président du Comité Hydrologique, Saint-Pétersbourg;

DE HOERSCHELMANN (Emile), Conseiller privé, Membre du Conseil des Ingénieurs au Ministère des Voies de communication, Tsarskoïë-Selo, près Saint-Pétersbourg.

Servia

CASSEL (Léon), Consul général, Bruxelles.

Siam

DU PLESSIS DE RICHELIEU (Phya Cholaynt Yothin) (Andreas), Vice-Amiral, Copenhague.

Spain

ARENAL (Fernando Garcia), Inspecteur Général des Routes, Canaux et Ports, Madrid.

Sweden

HANSEN (Fredrik-Wilhelm), Colonel, Président de l'Administration Royale des Forces motrices hydrauliques, Stockholm.

Switzerland

DE MORLOT (Albert), Inspecteur fédéral en chef des Travaux Publics de la Confédération Suisse, Berne.

Tunis

MICHAUX, Directeur général des Travaux Publics de Tunis, à Tunis.

Turkey

ISMAÏL NAZIM BEY, Secrétaire de la Légation Impériale ottomane, Bruxelles.

United States

BIXBY (W. H.), Brigadier General and Chief of Engineers U. S. Army, Washington, D. C.;

CORTHELL (Elmer Lawrence), Civil Engineer, New York.

Uruguay

JOSÉ M. MONTERO PAULLIER, Consul général de l'Uruguay, en Espagne, Madrid.

D

LIST OF GOVERNMENTS

Subscribing to the Association

NUMBER	NAME OF GOVERNMENT	AMOUNT OF ANNUAL SUBSCRIPTION in francs	DATE OF JOINING THE ASSOCIATION
1	Algeria	500	24 March 1910
2	Argentine (Republic)	2,000	28 December 1901
3	Austria	2,000	24 February 1902
4	Belgium	8,000	23 April 1901
5	Brazil	2,000	November 1906
6	Bulgaria	500	30 April 1906
7	Canada	1,000	11 September 1905
8	Chili	1,000	22 April 1904
9	China	1,000	29 July 1902
10	Danube (Commission of the)	500	24 May 1902
11	Denmark	1,000	24 May 1902
12	France	5,000	29 March 1902
13	French West Afrika	250	1st January 1907
14	Germany	5,000	29 October 1901
15	Great-Britain	5,000	9 June 1908
16	Greece	500	1st October 1908
17	Hungary	2,000	29 May 1902
18	Indo-China	250	12 July 1906
19	Italy	2,500	7 March 1902
20	Japan	5,000	15 August 1904
21	Mexico	1,000	31 July 1901
22	Monaco	250	29 October 1901
23	Netherlands	2,500	17 May 1902
24	Norway	1,000	1st April 1903
25	Persia	250	1st July 1908
26	Peru	1.000	30 October 1903
27	Portugal	3,000	3 February 1902
28	Roumania	1,500	12 June 1902
29	Russia	8,000	29 April 1903
30	Servia	250	4 October 1906
31	Siam	250	14 May 1903
32	Spain	3,000	15 April 1903
33	Suez (Intern : Canal)	500	27 September 1907
34	Sweden	1,250	4 July 1906
35	Switzerland	250	19 July 1901
36	Tunisia	250	21 May 1910
37	Turkey	250	1st July 1907
38	United States	5,000	28 June 1902
39	Uruguay	500	1st July 1910

PERMANENT INTERNATIONAL ASSOCIATION

OF

NAVIGATION CONGRESSES

Declaration of Adhesion for Corporations

I the undersigned, on behalf of :

Designation of the Corporation (1) .....

.....

.....

.....

.....

.....

declare herewith that the said Corporation adheres as a Permanent Member to the *Permanent International Association of Navigation Congresses.*

Together with this declaration sheet the fees for the year 191 . are remitted by Postal International money order amounting to .....and made payable to the General Secretary, *Permanent International Association of Navigation Congresses*, 38, rue de Louvain, Brussels.

Reports and other Publications are required in the ..... language.

Address .....

(Date) ..... *191* .

SIGNATURE :

---

(1) Public Administrations, Administrations of Provinces, Counties, Departments, Boroughs, Townships, Harbour boards, River and Port Authorities. Chambers of Commerce, Scientific or Technical Associations. Institutes of Naval Architects and Engineers. Marine Engineering Societies. Shipping firms. Shipping and Marine Federations, Associations and Societies, Yacht Clubs, Yachting Associations, Syndicates or Professional Associations or Unions, Transport Societies, etc.

Remark. — In accordance with Art. 2. of the Regulations, Corporations may appoint one official delegate, having a right to vote at every Congress, for each 100 Francs (£ 4) of their annual subsidy.

PERMANENT INTERNATIONAL ASSOCIATION

OF

NAVIGATION CONGRESSES

Application for Membership

The undersigned desires to join the *Permanent International Association of Navigation Congresses* as a Permanent Member.

He encloses with this form a Postal Money order for : (*)
fr. 10.— being his subscription for the year 191 (1),
fr. 30.— being his subscription for the years 191 to 191 inclusive (2),
fr. 125.— being his subscription as a *Life Member*.

Postal money Orders are to be made payable tho the General Secretary, *Permanent International Association of Navigation Congresses,* 38, rue de Louvain, *Brussels.*

Date..... *191* .

(SIGNATURE :)

Please attach a visiting Card

Surname.....

Christian names.....

Profession or Business.....

Address.....

(1) The yearly subscription is 10 Francs. For Permanent Members joining the Association during a Congress year, the fee for the first year is brought up to 25 Francs.

(2) Fees for THREE years may be paid by a single remrF t t oai0canefc3ns.

(*) Strike out what is not required.

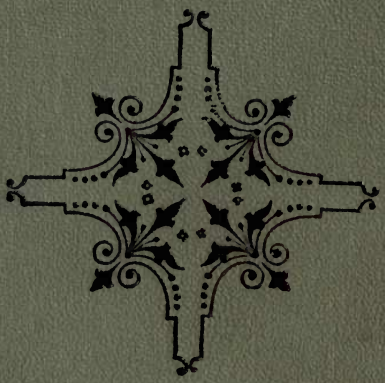
FOURTEEN DAY USE
RETURN TO DESK FROM WHICH BORROWED
ENGINEERING LIBRARY

This book is due on the last date stamped below, or on the date to which renewed.
Renewed books are subject to immediate recall.

APR 13 1971

LD 21–100*m*-2,'55
(B139s22)476

General Library
University of California
Berkeley

YD 28809

TC5
I5
1912